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The Fourth Industrial Revolution is the AI Revolution
An Academy Prospective

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ABSTRACT

The engines of the first industrial revolution were coal and steam, the second - electricity and cars, the third - computers and the Internet. Now, it seems, we are witnessing the fourth: the driving force of which will be artificial intelligence. This will require an unprecedented level of cooperation between governments, manufacturers, academia and civil society, all will be leaded by the role of AI in education, it is gradually becoming the "new engine" of dynamic growth of the national economy. The paper explores the main trends in the development of artificial intelligence, the study revealed that at present the field of artificial intelligence can be considered as a combination of cognitive science and computer science, that includes all aspects of using artificial intelligence in various spheres of life, such as: linguistics science, psychology, logic and Philosophy, mathematics industry, agriculture, public service, education, banks and finance, medicine, transport and transport system, household and services. The expediency of introducing innovative technologies in various fields, including a future perspective, is argued. Also the paper confirms that Artificial Intelligence is not for the student of Computer Science and Information technology only, but it is a methodologies to improve living standards, achieving social and economic equality, space exploration, migration, as well as its relationship with culture and art.

Key words : 4th Industrial revolution, Artificial Intelligence, Technology future, Disciplines of Artificial Intelligence, AI .

1. INTRODUCTION

Concept of the "Fourth Industrial Revolution (Industry 4.0) and the term "industrial revolution" is understood to mean a radical change in the life of society associated with the introduction of innovations. According to Klaus Schwab [1], founder and president of the World Economic Forum, the world is on the verge of the fourth industrial revolution. In just a few years, the biggest technological breakthrough is expected: full production robotics, artificial intelligence, robotic cars, and unmanned vehicles.

Manifestations of the 4th Industrial Revolution is the essence of the previous stage of the revolution is the dematerialization of all things and the provision of code to them. But with the help of operating systems and artificial intelligence, the opposite process occurs. Information is used to make clothes, tools, accessories, organs (3D printer), actions and services. The characteristics of the Fourth Industrial Revolution include the following innovations: [2]

- Internet of things.
- Cloud computing and digital platforms.
- 3D printers, modeling.
- Food synthesis
- Automated robots, self-driving machines.
- Neural networks.
- Gene modification.
- Biotechnology
- Artificial intelligence
  (limited, general, superintelligence).

Fourth Industrial Revolution Technologies is a new technologies in Industry 4.0 combine the physical, informational and biological worlds. The differences between man and robot, material and virtual, are erased. [2]

The head of the World Economic Forum identifies 12 technologies, divided into 4 groups, which can radically change the world:

1. The expansion of digital technology. Quantum computing will allow you to process information with incredible speed, immediately giving the final result. With the help of blockchain and distributed registry technologies, all types of financial transactions will be carried out. The Internet of things will make all devices automated and controllable using sensors connected to the Web.

2. Transformation of the physical world. Artificial intelligence and robots will completely replace the person in the workplace. In the future, it is planned to use things made from biodegradable and environmentally friendly material. On a 3D printer, multi-part production of things will be carried out.

3. Human changes. Bio and neuroethologies will become tools for the treatment of the most complex injuries, genetic diseases, and brain pathologies. With the help of virtual reality, the principles of training, doing business will change, the scope of entertainment will expand.

4. Environmental integration. In the future, it is planned to switch to new sources of nutrition, take root in the natural systems of the planet and minimize global changes.

5. The listed signs of the revolution have already been actively introduced into practice since 2018, but require serious improvements

Beyond the dangers, Industry 4.0 entails many useful changes. Klaus Schwab in The Fourth Industrial Revolution describes that there will soon be a revolution in the relationship of man with the world, his interlocutor and himself. Progress will improve the standard of living, increase the age of the world's population, and cope with global environmental problems. The author attributes to positive consequences [3]:

- economic transformation - it will become more transparent, banking and legal services will be carried out on the basis of a huge array of data;

- liberation of a person from routine affairs - the need for physical labor and monotonous work that does not require high qualifications will decrease;

- transparency of the world - in the future it will be possible to monitor every corner of the earth, control all changes and prevent negative events;

- individualization - all goods, actions and services will be selected for a particular person and his needs.

- he Internet of Things (Internet of Things, IoT) is a cloud environment that combines devices, devices and entire technological systems equipped with means of interaction with each other or with the external environment into a single managed network. The Internet of things includes not only physical devices, but also virtual models and environments, united by unified communication networks. The Internet of things is restructuring technological, organizational and even social processes, excluding human participation from their management.

- Internet of Things technologies significantly expand the possibilities of distance learning in education. Sensors, devices, laboratory facilities and entire laboratories connected to the Internet allow you to organize remote distance learning sessions using real, non-virtual equipment [7].

- Additive manufacturing (3D printing) is the process of creating material objects from digital models. The three-dimensional model is designed in the CAD program, after which the stage of breaking the model into elementary 2D layers is preliminarily completed and sent to the 3D printer for printing. The scope of 3D printing is practically unlimited at present. 3D printers are used in construction, medicine, education, architecture, design, marketing, advertising, automotive, modeling of clothes and shoes, archeology, jewelry industry [8].

- Additive technologies are actively being introduced into technological education. An examination of these technologies is also provided for by the Model Basic

Educational Program of Basic General Education. Many use 3D printers in additional education in the design and manufacture of model details, robots, and various technical devices.

o Artificial intelligence is a section of the complex of computer sciences whose main task is to create computing systems capable of performing creative functions that are traditionally considered only human-made. At the same time, an intelligent system is a hardware-software system that solves problems that are creative and related to a certain field of knowledge. Such a system includes a computing system, a knowledge base and an intelligent interface through which communication is conducted with the system without specialized programs for data entry. The main areas of research in the field of artificial intelligence are: robotics, recognition systems for images, characters, speech, machine learning.

o Achievements in the field of artificial intelligence made it possible to outline the still emerging section in pedagogy - robotics. The main tasks of this area are the design and use of artificial intelligence technologies in the educational process, such as virtual assistant teachers - avatars and catboats (bot tutors, bot diagnosticians, bot encyclopedists, etc.).

o Big data (Big Data) - information processing technology of huge volumes. When talking about big data, one should keep in mind not only large volumes, but also high speeds of receiving, transmitting and processing information, as well as a wide variety of types and formats of data. Big Data technologies will solve many scientific problems at a completely different level. Processing large amounts of information of educational systems, analysis of the learning outcomes and behavioral characteristics of students will allow the formation of individual educational routes, which is currently extremely relevant **[4]**.

o Virtual and augmented reality. Virtual reality - technologies in which the control object is a computer model of reality (English virtual reality, VR). The objects and subjects of models of real objects created by technical means are transmitted to a person through his sensations: eyesight, hearing, smell, touch, etc., at the same time there is an imitation of the impact and reaction to this effect of objects.

o Augmented reality - technologies that allow you to conduct an experiment, perceiving mixed reality (English mixed reality), i.e. In addition to real objects, the tester perceives information created using virtual model elements "supplemented" with the help of a computer.

- ○ Virtual and augmented reality - these are technologies that will be effectively applied, including with distance learning, allowing you to expand the capabilities of modern education. Based on these technologies, simulation laboratory stands and laboratory units with elements of augmented reality are created.
- ○ Some examples of the impact of advanced technologies of Industry 4.0 on the content and teaching aids in modern education are presented in the table.
- ○ Advanced technologies of Industry 4.0 in the content and means of modern education

2. ARTIFICIAL INTELLIGENCE [9]

We have probably heard about artificial intelligence, it is difficult to avoid this in our time. But it's not always clear what exactly is meant when it comes to artificial intelligence, and what does it have to do with seemingly different technologies such as unmanned vehicles and assistants with the messaging function.

However, there are prerequisites for clarity to come soon on this issue [5]. 80 % of companies use artificial intelligence in production activities, 30% plan to increase investments in artificial intelligence over the next three years, and 62% intend to hire a specialist responsible for artificial intelligence. [6]

In 2018, Microsoft hosted an artificial intelligence forum in India; The leader, who led the Windows business for a long time, announced that the next Windows 10 update would contain artificial intelligence. Facebook made its Pay Torch deep learning platform open, and Amazon, Google, and Microsoft added AI services to the cloud. [15]

When giants like Microsoft and Google build their corporate structure around artificial intelligence, we realize that this is an important area. The development of artificial intelligence is the next logical step in a world where huge amounts of data are accumulated. Companies that collect ever-increasing volumes of data need to understand what to do with this data and design the appropriate tools. At this stage, artificial intelligence comes into play.

2.1 What is artificial intelligence? [12]

Let's try to define artificial intelligence. John McCarthy, a computer science specialist who is often called the father of artificial intelligence, describes him as a complex of "scientific and technical means for designing intelligent machines, especially intelligent computer programs." [16]

In simple terms, artificial intelligence is an area of computer science focused on creating "intelligent" computers and machines that simulate human actions and reactions through machine learning, speech recognition, and problem solving. This is the opinion of Criti Sharma, vice president of artificial intelligence at Sage.

"If we ever used a predictive search on Google, asked Siri about the weather, or asked Alexa to reproduce a playlist of preliminary works, then you have already used artificial intelligence," Sharma said.

For this, it is necessary to find ways to endow computers with their binary logic with the ability to imitate human thinking, which is more abstract in nature and is supported by the ability to learn and adapt. This field covers not only computer programming, but also all society disciplines as linguistics, biology, mathematics, engineering and psychology and even judging as a unique discipline.

"We use the term "artificial intelligence "to mean programs that are not just encoded, but can be trained. In essence, we make computers think more intuitively by analyzing data and making forecasts, "says David Parmenter, Head of Data Processing and Analysis at Adobe. [10]

Popular descriptions of artificial intelligence, especially in films and television shows, focus primarily on sentient robots, humanoid servants, and out-of-control smart refrigerators. In reality, artificial intelligence has less to do with humanoids, but it affects a wide range of industries and scientific disciplines. Artificial Intelligence combines Big Data, computing resources and specially designed algorithms to teach programs to learn and adapt depending on the content of the data - patterns, aberrations, special information.

"A good example of artificial intelligence used by almost everyone?" - spam detection. Does everyone have a spam filter or some means of detecting fraudulent messages, "Parmenter notes." This is artificial intelligence. " [11]

At this stage, artificial intelligence does not have a computerized consciousness. At some point, human intervention in software algorithms, searching in the data, or issuing instructions to the machine in a different way is required. But with the development of technologies that make up the foundation of artificial intelligence, such programmable properties as knowledge, reasoning, training, and problem solving are constantly being improved.

As can be seen from the statistics cited at the beginning of the article, artificial intelligence is quickly becoming an important part of many industries - so much so that it is difficult for some companies to find personnel with sufficient skills in the field of artificial intelligence.

A key characteristic of artificial intelligence is that it empowers computers to learn. Following the new information, new opportunities are emerging thanks to improvements such as natural language processing and machine learning. This information, namely its arrays, plays a key role. Computers process data, recognize patterns in them and perform various actions with the information received.

Artificial intelligence is often associated with automation, but it is wider than simple, manual forms. These technologies

can be used for tasks that need to be performed frequently or in large volumes, but the key component is machine learning (which still requires human involvement).

In today's world, artificial intelligence is mainly used to improve existing applications. For example, applications such as Google Calendar and Spotify are already working successfully, but the emergence of speech recognition technology in a product such as Amazon Alexa, using a large amount of data, adds new functionality to both of them.

2.2 Types of Artificial Intelligence

- **Distributed Artificial Intelligence.** [17]

Distributed artificial intelligence based on a parallel computer system is a way to ensure the optimal use of all computing resources due to independent "nodes" in various geographical points with effective connections between them. Enhanced computing power is involved in distributed artificial intelligence, which makes it convenient for working with large data warehouses: different nodes can analyze different parts of information, and huge amounts of data can be processed faster than using other methods.

Independence of nodes also contributes to the adaptability and reliability of a distributed artificial intelligence system. In the event of a failure of one node, others may still function, and the system does not need to be completely redeployed after changing the data files.

- **Artificial superintelligence.** [14]

The Turing test, developed in 1950, is a test of the ability of a machine to exhibit intellectual behavior that is equivalent or indistinguishable from human behavior. If such a level is ever reached or surpassed, then it will be an artificial superintelligence.

While artificial intelligence refers to computers that can mimic human thought, artificial superintelligence implies that computers have surpassed humans. So far, we assume that computers have not yet reached this level. Perhaps it will never be achieved, because full artificial intelligence has not yet become a reality. Talking personal assistants, such as Alexa and Siri,? Are a step in this direction, but so far they are still far from the human (or superior to human) level of cognitive abilities and knowledge?

- **Weak artificial intelligence.**

Also known as narrow artificial intelligence, weak artificial intelligence exists in a special world, such as a video game, but does not go beyond it. It represents an approach to artificial intelligence, in which it is recognized that technology will always be just an imitation of human knowledge, capable of acting according to given rules, but never outside of them. Weak artificial intelligence can act according to the rules, but at the same time is bound by them and does not have truly human cognitive capabilities.

- **Strong artificial intelligence.**

At this stage in the development of artificial intelligence, strong artificial intelligence is more a philosophy than a practical approach to technology. Strong artificial intelligence, also known as full artificial intelligence, is a design that mimics the human brain.

Philosophically, strong artificial intelligence makes no distinction between software and artificial intelligence, accurately simulating the human brain and, therefore, the actions of the person himself. The philosophy is that a computer can be programmed to reproduce all the characteristics of the human brain, as we understand them, with mental and cognitive abilities that are currently considered to belong exclusively to humans. But since we still do not fully understand what human intelligence is and how it develops, the guidelines for developing strong artificial intelligence are still not clear.

- **Subsections of Artificial Intelligence**[13]

There are several subsections of artificial intelligence: deep learning, neural networks, machine learning, natural language processing, cognitive computing, and computer vision. All of them can be considered as members of the artificial intelligence family. Sometimes the term "artificial intelligence" and the names of these subsections are used interchangeably, but in reality they are all placed under a large "umbrella" of artificial intelligence.

Deep learning

Deep learning uses the powerful computing resources of neural networks and computing devices of different levels to search for patterns in large data arrays (for example, to detect images). These models, which belong to the machine learning subsection, learn from the data they provide, therefore, in order to achieve efficiency and accuracy, there must be a lot of data. When you use Google Image reverse search or ask Amazon Alexa a question, you get the answer through deep learning.

Neural networks

A neural network as a type of machine learning is composed of interconnected blocks that process information based on external data and forward this information between the blocks. Blocks work together as neurons, hence the name.

Dr. Robert Hecht-Nielsen, who developed the first neurocomputer, defined a neural network as a computer system composed of simple, deeply interconnected processing elements that process information by dynamically responding to external input signals.

The idea itself is not new, but only in recent years have sufficient computing resources appeared to move forward the development of neural networks.

Machine learning

Sometimes the terms "machine learning" and "artificial intelligence" are used interchangeably, which shows how important the former is to the latter. It is not the same thing;

machine learning is the gold standard of artificial intelligence, and it is it that is developing most actively.

In the same way that artificial intelligence embraces a variety of technologies, such methods as statistics, physics, neural networks and operations research, are combined in machine learning to search for hidden patterns in data, especially those for which the machine has not been programmed. Machine learning is a key element of artificial intelligence, as it allows the machine to do something "human", for example, to prepare access to Big Data. There is a difference between a server that simply stores large amounts of demographic information and a computer that uses this information to find patterns, complete tasks, and respond to changes in data.

Natural Language Processing

The phrase "natural language" in this case means the language used by people, such as English, in contrast to the computer programming language. In the process of processing a natural language, such a language is used to communicate with a programmable artificial intelligence system. When you ask a Google assistant to schedule an event, speaking out loud or typing in the keyboard "Visit the hairdresser at 2 p.m. next Tuesday", you turn to natural language processing. The recent popularity of personal assistants such as Amazon Echo? Is a direct result of improved natural language processing.

Natural language processing consists of two components: understanding and generation. Understanding consists in comparing input in a natural language with useful ideas and analyzing various aspects of natural languages. Generation is the process of generating a meaningful conclusion in the form of words and sentences, it consists in planning the text and sentences, as well as implementing the text.

Cognitive computing

Cognitive computing is based on artificial intelligence and signal amplification. Cognitive computing can be encountered when using an assistant based on a messaging program; their goal is to organize interaction close to human, imitating human processes. In a sense, cognitive computing brings together various subsets of artificial intelligence, including machine learning and natural language processing, but so far in this relatively new area, definitions remain blurred. Probably the most famous example of cognitive computing is Watson, IBM's supercomputer.

Computer vision

Computer vision is another interdisciplinary field in the field of artificial intelligence. With it, computers can learn from images and videos, automating tasks for which people use eyesight: for example, look at a photo and determine what is shown on it. In this case, you need to collect, process, analyze and understand digital images and the data that they contain.

Data role

To act and respond, computers need information. The development of artificial intelligence is partly not due to the progress of new technologies. It's about data, huge data arrays. The company will not be of great benefit, simply having a large amount of information for which there is no application, and the search for such an application - determining the best ways to process, analyze and manipulate data - has become the goal of many companies and scientific institutions.

"Today, companies have an incredible amount of data that is truly valuable if they could be used in business," Parmenter notes. "" Artificial intelligence can simplify the process of acquiring knowledge, which will make our daily work more convenient, productive and useful. "

The importance of this data has also sparked controversy over recent deployments of artificial intelligence. The requirements of the General Data Protection Provisions (GDPR), recently adopted in Europe, and the regulations governing the collection of data, which will begin to operate in California in 2020, may limit the amount of data available to artificial intelligence systems for machine learning. Some technical experts, including Microsoft, are calling for rules for using face recognition technology.

2.3 AI Deployment Areas

It may seem that artificial intelligence has appeared out of nowhere in the last few years, but in fact, the ideas and technologies that underpin modern advances are almost 100 years old.

For the first time in English, the word "robot" was used almost a century ago, when the play "Rossum universal robots" by Karel Chapek [18] was staged in London, and in 1945 the term "robotics" was first used by Isaac Asimov. The term "artificial intelligence" has been used for several decades, since 1956. It was invented by McCarthy, who in the same decade created the LISP programming language for artificial intelligence. Initially, work on artificial intelligence was aimed at solving problems and was represented by the first works in the field of neural networks, the foundations of which were laid in 1943.

In the 1960s, the U.S. Department of Defense began work on artificial intelligence. This work continues to this day and contributes significantly to progress. Developments in the field of machine learning, an important part of artificial intelligence, began in the 1980s. In 1964, a dissertation was published that showed that computers can understand natural language enough to solve algebraic problems. Also in the 1960s, the world saw the interactive program ELIZA and the Shakey robot solving problems.

The first computer-controlled unmanned car appeared in 1979, and by 1990 the first successes in the field of artificial intelligence were achieved, which you can be proud of: demonstrations of machine learning, data analysis, development in the field of natural languages and virtual reality. In 1997, IBM's Deep Blue machine defeated Garry

Kasparov, who was then the world chess champion, and in the new millennium robots entertained people at home and explored the inaccessible territories of the planet. To a large extent, thanks to the work done in the early decades, recent advances in technology, the foundation of artificial intelligence, have led to significant progress in recent years.

Currently, work in this area of artificial intelligence can be divided into two large categories: applied artificial intelligence and generalized.

Applied artificial intelligence is focused on a single task, for the solution of which it uses the ability of a programmable machine to imitate the human mental activity.

Focusing on a single task may seem limited, but great success has been achieved in this area. The real advantage of applied artificial intelligence is the ability to use technology to analyze a huge amount of data and perform subsequent actions much faster than a person does.

For example, applied artificial intelligence can be used to detect fraud in the financial industry, which allows machines to process and analyze large amounts of computerized financial data in order to find patterns and deviations from these patterns.

In the field of maritime transport, applied artificial intelligence allows you to process data from thousands of ship manifests and records filled in every day in the world in order to optimize port loading and ultimately reduce transport time. Applications like Waze use traffic data to predict traffic on a specific road at a particular time of the day.

2.4 Generalized artificial intelligence

Thanks to mass culture, the concept of artificial intelligence that has developed among many of us belongs to the generalized category of "machine intelligence", which, like human, can be applied to any task.

Generalized artificial intelligence has not yet become a reality. We don't know enough about the human brain to correctly model its work, and the enormous computational capabilities of the brain are unattainable for machines. But development is steadily moving towards the practical implementation of generalized artificial intelligence.

2.5 Practical application in the modern world

"Artificial intelligence works best when solving practical problems, because it was designed to make our life convenient and at the same time help us work more intellectually," says Parmenter.

Today it is difficult to find an industry not affected by artificial intelligence.

"Instead of considering artificial intelligence as a hostile force, companies and consumers should perceive it as the most important partner for growth, increased efficiency, the exclusion of manual work and the development of diverse industries," Sharma believes.

Parmenter gave an example of the Adobe Scan application, which allows the user to photograph a document and save it in the cloud. One potential use is to store medical information, such as test results. But artificial intelligence means that we are moving from applications that simply store this information to the use and processing of information in new ways.

"A sheet of paper can be wrinkled and not look the best. Since Scan has the Sensei function, the problem is automatically detected and fixed, so that the document looks like a smooth sheet of paper, "comments Parmenter." This is artificial intelligence, its application can be so simple. "

Artificial intelligence is a common name for a variety of complex technologies, but today many of the practical applications of artificial intelligence in the consumer sector and in enterprises are focused on narrow tasks.

"And yet, modern artificial intelligence technologies allow us to solve much more complex tasks in business and everyday life - from managing the workforce to combating climate change," Sharma said. "In different sectors, companies will have to perform external deployment of artificial intelligence solutions for more complex and socially significant tasks. Only then will we see how the potential of artificial intelligence is fully revealed. "

2.6 The future of artificial intelligence

We have not yet reached such a level that HAL or C3PO appears in our lives, but the field of artificial intelligence is developing rapidly.

Today, 5% of all company personnel perform administrative functions, according to the Sage survey (http://www.marketwired.com/press-release / sage-survey-shows-that-unleashing-business-builders-from-b urdensome-administrative-tasks -2233347.htm) released in September 2017. Performing appropriate tasks without human intervention will save $ 333.3 billion each year in the United States.

"In the future, artificial intelligence must take on all manual operations so that employees have more time to innovate and increase labor productivity," Parmenter believes. "For example, using artificial intelligence, companies can find patterns in the content stored in the cloud "And then take the time to use this information in a useful way, instead of sifting through mountains of data in search of the knowledge that will now be highlighted by the machine. Medical research laboratories and pharmacological companies can use artificial intelligence to search for research results and use them in their own work or to compare with their results. "

"The prospects are impressive, and the applications are almost endless," concludes Parmenter.

There are some concerns about how artificial intelligence will be applied or will be applied in the future, even if we do

not have to be attacked by intelligent humanoids after we allow them to develop too successfully. For example, face recognition technology is based on processing huge amounts of virtual data. One source of such data is driver's license photographs, and in some states these large databases with millions of digital images are already being used by the police, in particular to identify suspects. The tool is very powerful, but the potential for abuse is obvious.

There are also practical concerns regarding the potential use of artificial intelligence. When it will be possible to automate the various tasks that currently require human participation, what will happen to the staff performing these duties? There will be a demand for technical skills, but are there employees who will mainly be those who perform easily automated functions, at least in the near future? Artificial intelligence will have to transform ways of working. It is not yet clear how this will happen, and so some are worried.

However, according to Sharm, among the sought-after skills will be not only technical. As the time approaches, when artificial intelligence can code itself, the creation of intelligent machines and the integration of artificial intelligence in the workplace will require skills such as creativity and emotional intelligence.

"As the billionaire investor Mark Kuban recently said, in 10 years the demand for humanities will be greater than for programmers, and maybe even engineers," Sharma notes. "Retraining and re-equipping personnel for an automated future, as well as understanding that "artificial intelligence works best in combination with human intuition, will serve as the basis for the success of companies."

Sharma also points to a growing understanding of the role that human subjectivity plays in programmed technology, and how artificial intelligence can both aggravate and mitigate the effects of this subjectivity.

"Automation of the personnel department and its tasks will help company management to really focus on personnel, especially when hiring. We are already noticing changes, starting with the use of artificial intelligence in order to help in the study of autobiographies and to eliminate bias in the estimates, "she explains." However, the result can be both useful and harmful to the company. "Most companies have difficulties with the formation of diversity in teams and personal bias in interviews, but habitual prejudices may well be built into artificial intelligence algorithms, depending on who designs them."

Large tech companies are making significant investments in artificial intelligence and are working to eliminate potential hazards and typical artificial intelligence functionality.

In 2017, technical giants, including Google, Microsoft, IBM, Amazon, and Facebook, founded Partnership in AI (https: // www. Partnershiponai. Org /) with the stated goal of approving ethical standards in technology and preparing rules for its further development and use.

"Undoubtedly, artificial intelligence leads to fundamental changes in business, society and ethics," Sharma emphasizes.

Responsible management of these changes requires taking measures from the very beginning, since correcting subjective addictions and errors in the real world is much more difficult than preventing them from the very beginning. But there is an opportunity to increase the efficiency of development and achieve better representation of the audience to which the development is oriented, if we expand the circle of people who design artificial intelligence.

"First of all, the task of artificial intelligence should be to create fair conditions for people," Sharma said. "Artificial intelligence provides new, scalable opportunities for democratization of both access to technology and the environment for work.

3. AI IN EDUCATION: SOCIO-PHILOSOPHICAL ASPECTS

In the philosophy of education, it is customary to comprehensively consider it in the unity of the value, system, process and effective components. [20]

3.1 Artificial Intelligence and Education as a Value

A keen attention to the problem of education as a value arises against the background of "cultural homogenization", which is the result of mass digitalization, the use of the Internet, the spread of unified standards and qualifications in education (including supranational and cross-border). Online platforms meet the aspirations of states and participants in the education market to find an effective instrument of competition at the international level. [19]

The contradiction between local and global in education is based on value differences and similarities. It is the digital environment that becomes the medium of the formation, translation and implementation of value systems. This actualizes the request for monitoring value matrices throughout life, the contribution of education to the folding of value systems and their transformation. Against the background of the general growth of the importance of real and virtual communities in all spheres of society, AI with the fixing of value communities is seriously transforming social relations and the political sphere. Without a socio-philosophical assessment of such prospects from a position of values, the massive use of artificial intelligence systems is quite dangerous.

National educational systems face the urgent need to identify and then support young talents nationwide. One of the vectors of big data analysis for educational purposes is the analysis of the heritability of intelligence and abilities. Together with the use of digital portfolios, this will open up prospects for both effective management of the resources of the educational system, and for possible social stratification on the identified grounds, stigmatization of certain groups and members of

society, medicalization and genetisation of many social processes.

The use of AI systems in education is consistent with the value system for personalizing education. Personal textbooks with artificial intelligence were called "diamond primer" in the literature (according to the book "The Diamond Age, or Primer for Noble Maidens" by the American science fiction writer, father of cyberpunk Neil Stevenson). Diamond primers, as adaptive systems, analyze the learning process by multiple parameters, take into account individual characteristics and offer support, monitoring and evaluation tools.

The target setting for the use of such systems in education is to ensure that the individual characteristics of students are taken into account, allowing for acceptable educational results for some and in-depth and accelerated education for others. But will these features not become "glass ceilings" for the AI, finalizing the results of education by, albeit difficult, but external criteria for the education system?

In education, using artificial intelligence, it is declared that at the center of adaptive learning is the learner himself, his abilities and decisions about what, in what sequence and with what depth to study. This attitude very sharply raises the question of whether the educational system can at least partially smooth out inequality or become a factor in consolidating and reproducing social inequality?

- **Case**

In 2014, in the UK, a group of reputable scientists showed that differences between children in educational achievements are very inherited from the early school years to the end of compulsory education at the age of 16, when British students are assessed nationwide using standard achievement tests (general certificate of average Education GCSE).

Genetic studies have shown that intelligence makes a significant contribution to the heritability of educational achievement. However, it has been shown that personality traits and psychopathology also have an effect on GCSE scores beyond what is predicted by intelligence. Together with it, these features account for 75% of the inheritance of GCSE estimates. These results emphasize the importance of genetics in educational achievement and its correlates. The results also support the trend in education towards personalized learning. The same big research data can help understand how the environment can change educational achievement.

3.2 Artificial Intelligence and Education as a System

In the digital age, the education system and its individual elements are developing along the paths of decentralization and flexibility (rejection of strict standards, a list of professions as the basis for determining the areas of training in higher education, dividing into levels - undergraduate, graduate, postgraduate studies - in favor of modular and short-term programs, trainings) With the further merging of the online and offline environments and the development of augmented and virtual reality technologies, the physical presence of a person in the territory of an institutionally formed element of the education system will become optional.

- **Case**

For the education system of modern China, the trends for 2018-2022 are: streaming integrated online services; digital instructional materials; mobile restructuring of training scenarios, practice, testing, and management of all aspects of the development of an educational organization based on AI, increasing the interactive and social aspect of training; desynchronization of technological and educational changes, multidimensionality of traditional and innovative education.

3.3 Artificial intelligence and education as a process

Digital education began with the Learning Management System as a way to support traditional educational courses, the joint assembly of offline and media training formats. Open educational resources are designed to satisfy the massive demand for lifelong education, correspond to the desire of people to study according to individual curricula and get an inexpensive education with a constant increase in the prices of formal education.

Today, educational content is segmented into two categories: Micro Learning ("I need a specific answer right now") and Macro Learning ("I want to learn something new"). The prospect behind Spaced Learning systems is training, where there is time between the blocks of knowledge for discussion in the community, application of acquired competencies, repetition and deepening of the past, which corresponds to the increasing role of communications in society and the high rate of change of scientific knowledge and social interactions. VR-technology, supplemented by artificial intelligence, will change the parameters of the virtual space depending on the actions of users, which will allow to develop skills in applying knowledge. Learning tools VR and AR are applicable for learning to work with too complex, dangerous and expensive systems and processes.

- **Case**

A system called Fear Not creates virtual worlds with characters that children can interact emotionally with. The goal is to empathize with them, to try out ways to help victims of bullying in the virtual world (to appropriate the best ways to combat bullying).

The education process is influenced by the dominance of the game as a format of interpersonal interaction. The gamification of AI-based education will affect long cycles, adjusting to the level of the playing-learner. Through edutainment (edutainment - the process of merging learning

and entertainment), artificial intelligence will continue to break the line between education and leisure, work and play, and will expand the educational environment through virtual and augmented reality technologies. The social consequences of this for social statics and dynamics have yet to be comprehended, but it is obvious that they are ambiguous.

Due to AI, further transformations will undergo relations between key subjects of education - those who teach and those who study. The influence on the particular student's individuality of the teacher has already decreased and will decrease in the future, in fact, the organizer of education will become the main subject of the educational process. One should expect the development of virtual tutors, chatbots - intellectual assistants and mentor networks of "second-tier mentors". At the same time, it is extremely important to preserve the role of the teacher in broadcasting the actual "human in man" when changing the social status of the teacher and correcting training programs in pedagogical areas. [21]

The guiding and advisory functions of AI can contribute to improving the quality of the educational process, suggesting optimal personalized learning tactics by analyzing the ratio of methods and student progress according to different criteria of educational quality, evaluating the student's motivation and emotional state. Similar features are implemented in the Smart Sparrow system, where you can track the progress of each student.

However, constant monitoring of educational communication can become a factor of demotivation for both students and teachers, the basis for the application of social sanctions and restrictions, their legislative consolidation and public approval. However, one can hardly expect unambiguous social support for such measures.

- **Case**

The Proctoredu product is able to track the behavior of multiple passing people at the same time: whether there are "extra" people in the frame, whether there are "extra" voices in the room, how often the dealer takes his eyes off the monitor, does he try to change the tab in the browser. All these actions are recorded as violations. In special cases, the system gives a signal to a person-proctor to pay attention to one or another dealer.

AI for each person will become a means of supporting education throughout life, focused on the extension of its quality. According to a PwC survey, 58% of managers and technology experts are confident that by 2022, artificial intelligence will be able to replace a personal tutor.

3.4 AI and parenting

We must not forget that education is the unity of training and education. We can assume an increase in the controlling

function of artificial intelligence. But how does AI control match educational practices and goals? What should these goals be in the VUCA world? Questions are open.

- **Case**

Bark, a parental control phone tracking app, "scans" major messaging and social networking, email, YouTube, and other platforms to look for signs of cyberbullying, depression, suicidal thoughts, and sexting on a child's phone. Therefore, busy parents can save time and find peace of mind.

3.5 Artificial intelligence and education as a result

Education is the fixing of achievements. The diploma is being replaced by digital passports of achievements, which will automatically be replenished with new entries throughout life. Both hard skills (knowledge, results of using knowledge) and soft skills (personal skills) will be fixed.

Soft skills (based on the report "Labor Skills of the Future 2020"): [22]
• understanding of the meaning;
• understanding of others;
• flexible thinking;
• communication skills with representatives of different cultures;
• ability of abstract thinking;
• critical assessment ability;
• application of an interdisciplinary approach to understanding entities;
• ability to achieve goals;
• the ability to highlight key information;
• virtual collaboration skills.

Systems in automatic mode, analyzing behavior during the educational process, create a digital footprint as a product for the market. Moreover, it can be both individual and collective. The change in the procedures for evaluating educational results (from exams to practical team projects) will be affected by the demand for the meta-competence of team interaction as the dominant form of social life, and, consequently, education.

Automation of routine intellectual work, freeing up time can make significant landmarks of modern education (for example, competences in the field of knowledge of foreign languages or specific professions) unnecessary. At the World Economic Forum in Davos, Israeli scientist Yuval Noah Harari, a medieval historian, best-selling author of Sapiens: A Brief History of Humanity and Homo Deus: A Brief History of Tomorrow, pointed out that "people now face a more terrible concept than exploitation , - with its uselessness. When you are being exploited, you at least know that you are important, that there is no one else to work for. " AI in education should be aimed at updating the skills of self-development, developing competencies of self-employment and flexible adaptation to different life contexts and environments,

3.6 The Effects of AI in Education

The development of the educational system using artificial intelligence requires serious social and humanitarian expert support. Education, functioning in the absence of a socially approved development guideline (with the proviso that the very existence of such a guideline is problematic in the VUCA world), is forced to create an image of the future within itself. The valuable components of this image largely determine the direction and assessment of the use of AI in education.

Artificial intelligence can become a factor in improving the functioning of the education system through the use of big data in the management of the education system. However, an education system focused on decentralization and flexibility risks losing the function of a social elevator if the use of AI will only adjust education to the starting conditions (intelligence level, motivation features, and social environments), introducing explicit or hidden restrictions on social mobility.

Digitally capturing education outcomes is both the greatest opportunity and source of serious social risks and threats. In accordance with the trend of personification of the processes and results of education through AI, a transition will be made from knowledge management to the formation of soft skills and further to the management of resource psychophysical states. The biomedical and neurophysiological knowledge of their own physicality, which is growing in connection with the development of 4P medicine based on artificial intelligence, will give rise to socio-philosophical problems , some of which are common to medicine and education.

The educational process, changed by AI and neuro-technologies, will require a value justification and determination of the formalized boundaries of the psychological impact on the subjects of education. A quick solution requires the task of maintaining data confidentiality and determining access modes to them, the purposes of their use, as well as the problem of responsibility for artificial intelligence errors. In education, the problem of maintaining a focus on human dignity as the highest value is associated with the need to avoid educational discrimination, and artificial intelligence is trained in various forms of behavior, including sexism, racism, bullying, and so on. In education, as in healthcare, the use of AI will exacerbate the issue of equity in access to public goods.

4. ARTIFICIAL INTELLIGENCE AN ACADEMIC KNOWLEDGE AREA

The paper concern is only for the AI knowledge area level and not to include any curriculum of syllabus or even course details To explain the knowledge areas
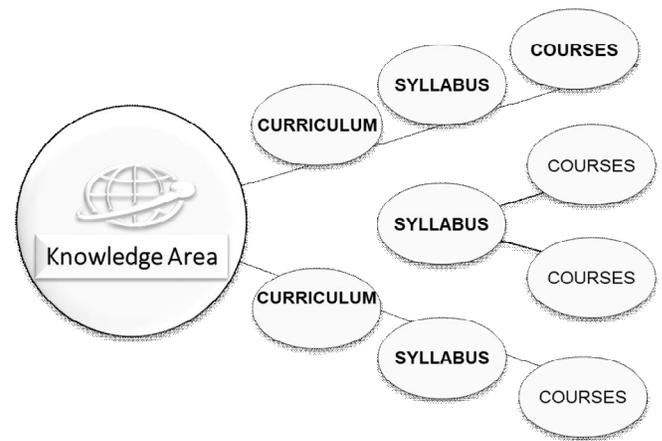

Figure 1: AI Knowledge area

Knowledge Area
> The core knowledge that support achieving the objectives Based on the strategic plans GOALS

Curriculum
- General guidelines Baseline for syllabus
- More useful for administration task

Syllabus
- Gives a more focused outline for particular subjects.
- Details and specific.
- Baseline for the Courses / textbook
- More useful for teachers

Course
- An area of specific study, with its own particular rules and expectations
- Baseline for the accumulated GPA

In what areas can Artificial Intelligence be applied?

Artificial intelligence has assumed an important, even fundamental, role in the life of modern man. There are many applications of this technology, which has facilitated various aspects of everyday life of people and businesses.

In this paper we will cover which knowledge areas where Artificial Intelligence is already being applied today.

Artificial Intelligence and Health [23]

The application of Artificial Intelligence has been of great help in the health area. Because it can be used to assess the possibility of treating disease, considering data from those already identified around the world.

Patient care protocols have been used to assess health status. Also, it provides indications of preventive ways to be provided to attending physicians.

In addition, there is the use in preparation of complex exams and preparation of laboratory and imaging exam reports.

Artificial Intelligence and Agriculture

The use of artificial intelligence contributes to the productivity of the agricultural area. It assists in the spraying carried out by robots that evaluate the conditions of the plantations and perform the preparation and treatment of the land for their cultivation.

The application of defenders and indications of crop harvesting points are also areas in which Artificial Intelligence occupies an important space.

Artificial Intelligence and Everyday Life

We make use of Artificial Intelligence in our daily life without realizing it. For example, when we access *streaming* services we are coming across movie suggestions as per our previous behavior, being a result of reviews of this technology.

The same is true when we search Google, YouTube, etc.

Artificial intelligence in complex and risky tasks

Artificial Intelligence also assists in activities that may pose risks to human health such as the exploitation of underground mines.

In these applications, robots are used to define the locations most likely to succeed in excavation.

Artificial intelligence and industrial use

The use of Artificial Intelligence in the industry occurs in automobile assembly lines and in material inventory schedules and supplies of these lines.

Acting on the needs of items and raw materials required for production, they play an industrial planning analysis role.

Artificial Intelligence applied to Marketing

The impact in the area of Marketing by Artificial Intelligence was important because it changed the way of obtaining and analyzing consumer data and behavior.

By using the treatment and evaluation of market data, it became possible to establish a new level of action for this area.

Artificial Intelligence and Strategic Planning of Organizations

Artificial Intelligence has been adopted and has had a major impact on the corporate world, as technology enables agility and security in strategic planning stages within organizations.

By obtaining more assertive, faster-generated information on market trends and customer and supplier behavior, it becomes possible to improve planning and adjustments to already defined strategies.

The impact on other business areas is also occurring, as it enables the deployment of integrated analysis tools across the various business sectors and areas. This fact allows improvement of information, controls and records.

Artificial Intelligence and Human Resources[27]

Artificial Intelligence has allowed us to broaden the scope of our recruitment and retention areas more precisely. This is because there is information from employee data and the search for new talent.

In addition, its importance is enormous as it contributes to increased access to information and cross-checking for better assessments and goal setting. But not only because it improves policies of benefits and incentives, favoring the meritocracy effective and performed by facts and data.

Artificial Intelligence and Internet of Things

Enabling the IoT is already a prospect for the near future. This is due to the development and enhancement of Artificial Intelligence features.

This technology allows automatic activation of remote equipment as desired by the user. Thus, there will be greater autonomy to perform operations according to standards evaluated by this technology.

In short, it will be the time of autonomy and independence of all the resources around us.

Final Thoughts on Artificial Intelligence

Artificial Intelligence was developed to allow greater comfort and safety to various activities in the life of modern man. Thus, it proposes benefits and advantages that impact several areas.

1. *Goals and objectives of discipline :*
   1.1. The purpose of teaching the discipline:
   – To form a systemic basic representation, primary knowledge, abilities of students on the basics of knowledge engineering and neuro informatics as two main directions of building intelligent systems.
   – To give general ideas about applied systems of artificial intelligence (SII).
   – To give an idea of the role of artificial intelligence and neuro informatics in the development of computer science in general, as well as in scientific and technological progress.
   – To prepare students for the application of the concepts of intelligent systems in teaching at the magistracy and in the graduate design in specialty 230102 - Automated information processing and control systems .

   1.2. Learning Objectives: **[23]**
   – Students mastering the basic principles of using the theory and methods of artificial intelligence and neuroinformatics in building modern computer systems.
   – Their practical skills in the study and construction of artificial intelligence systems.

2. *Place of discipline in the structure of*

OOP Malware

The discipline " Systems of artificial intelligence " refers to the Professional cycle, the discipline of choice .

The list of disciplines, the assimilation of which by students is necessary for the study of this discipline:

- – Decision theory,
- – Logic and thinking theory
- – Fundamentals of Management Theory,
- – Modeling systems.

5. CONCLUSION

In the academic entities (universities) a new Artificial Intelligence Technical Committee should be built on the mirror profile of the international standards to include working groups responsible for the unification and quality assurance of AI technologies, as well as specializing in the formation of standard requirements for artificial intelligence technologies in various industries.

This will allow you to focus on solving the following problems:

- development of terms and definitions, conceptual provisions in the field of AI, preparation of other fundamental standards;

- standardization of typical architectures of AI systems, data presentation formats in AI systems;

- development of requirements for indicators and quality criteria of systems with AI, general methods of ensuring confidence in AI systems, including methods for identifying and countering specific threats to the information security of automated systems with AI;

- development of unified rules for assessing the functional characteristics of systems with AI in solving applied problems in various sectors of the economy, including education, healthcare, industry and construction, defense and security, agriculture, transport, etc .;

- determination of the role and boundaries of the use of AI systems in various applied industries, assessment and minimization of risks, ensuring the reliability of the use of systems.

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