

**FUNDAMENTAL FOUNDATIONS IN THE FIELD OF ARTIFICIAL INTELLIGENCE
AND METHODS FOR APPLYING THE RESULTS OF APPLIED RESEARCH IN
PRACTICE**

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Annotation: This article discusses the issues of creating the foundations of fundamental research in the field of artificial intelligence, conducting applied research, and developing ways to apply scientific developments in practice.

The development of artificial intelligence is characterized by scientific problems and methods, including deep learning, data processing, the development of fundamental scientific areas the creation of applied solutions based on them in almost all areas of the digital economy.

As a solution to these problems, the project aims to establish a practical artificial intelligence research center based on "smart innovative technologies" within the framework of the artificial intelligence project, whose mission is to create a scientific and technological base for solving a wide range of practical tasks in order to ensure sustainable economic development. It also includes optimizing management decisions, identifying weaknesses, and reducing economic and social risks resulting from climate change in the republic.

Key words. fundamental and applied artificial intelligence, research approach, formulation of scientific hypotheses, development driver, new product creation, sustainable development, scientific developments.

Introduction. The theory of "artificial intelligence" is considered by research scientists, and its problems are that it should reflect the results of fundamental and applied research in the field of artificial intelligence, as well as in the fields of science and technology and related disciplines in which it is developing, and facilitate its implementation.

Fundamental and applied research in the field of artificial intelligence, as well as scientific research conducted in scientific institutions, should be presented, along with problems in the field and ways to solve them.

The author believes that it is necessary to accelerate research in artificial intelligence and related fields and achieve results, continue research in more specialized areas of science and technology, and connect scientific developments in these areas with practice.

The first statistics on the use of digital technologies in organizations were presented[1].

Because, today, countries cannot develop without using the results of research and development carried out by scientific institutions. It is necessary to study current problems in the field of artificial intelligence in our country, to obtain fundamental and applied research developments, as well as key technological scientific results.

Problem statement. There are problems with fundamental and Applied Research in the field of artificial intelligence. concerns the transparency of artificial intelligence systems, the environmental impact of artificial intelligence, and ethical concerns.

Problems with fundamental research: lack of sufficient transparency and explainability; the fundamental impossibility of creating strong artificial intelligence; insufficient understanding of the nature of human consciousness; lack of personnel in the field of artificial intelligence.

Problems with practical research: errors and misinformation; data privacy; environmental impact of artificial intelligence; lack of knowledge of scientific personnel in the field of artificial intelligence.

These issues are interconnected and require a comprehensive approach that includes technical innovation, legal regulation, traditional professional responsibility, relationships with it, and ethical standards. The features and prospects of digital services of the intellectual world are formed based on the systematization of the main directions of digital development and the definition of the system-creating impact of new technologies and mobile communication network standards on business, management, and society scenarios[2].

Solution method (or methods). In the field of artificial intelligence, various methods of solving both fundamental and practical issues are used. Focused on the study of intellectual processes and the creation of relevant mathematical models. Methods of fundamental Research in the field of artificial intelligence: theoretical methods; methods for modeling and automating reasoning; methods for planning and automating purposeful behavior; improving the skills of scientific personnel in the field of artificial intelligence.

Quantum computing can also be used in fundamental research - they allow you to quickly and efficiently solve complex problems that cannot be solved within the framework of classical models.

It aims to use the capabilities of artificial intelligence to solve specific problems, automate tasks, and increase efficiency in various industries. Methods of applied research in the field of artificial intelligence: data collection and preprocessing; function development; model selection and training; evaluation and validation; monitoring and maintenance.

Artificial intelligence agents can also be used in practical research - a set of autonomous software elements that interact with each other and learn from their own experience in the process of performing complex tasks without human intervention. Their main feature is the ability to solve arbitrary tasks that the artificial intelligence-agent has not been previously trained to solve.

As part of the study, a universal method was proposed for analyzing regions by level of sustainability based on the formation of ratings by indicator groups[3].

Innovative methods in scientific research include:

- Computer modeling - using special software tools, scientists create virtual models of objects and phenomena, analyze their behavior, and obtain results that can be used to develop new theories and hypotheses.
- Sensor technologies - thanks to the use of various sensors and measuring instruments, scientists receive accurate information about the state and parameters of the object under study.
- Network technologies - thanks to the use of networks, scientists can exchange information, work together on projects, and conduct experiments remotely.
- Use of artificial intelligence - Artificial intelligence allows for the processing and analysis of large amounts of data, which allows scientists to identify patterns and make predictions.

It is worth noting that the boundary between fundamental and applied research is often blurred - in modern scientific practice, there are increasingly examples of "directed fundamental research" that, although aimed at obtaining new knowledge, have the prospect of practical application. For example, laser technologies, which are now used in all fields, from medicine to industry, originated from fundamental research in quantum physics.

Results and examples. The results of scientific developments in the field of artificial intelligence are being used in various fields of science and education. Artificial intelligence helps researchers process large amounts of data and test hypotheses, saving time on analyzing and interpreting the results.

The essence, features and specifics of artificial intelligence technology, the results of the substantiation and systematization of the trends in the development of artificial intelligence and its application in socio-economic activities, as well as the main trends and main directions of use of generative artificial intelligence in World Development are revealed[4].

Scientific research is divided into three types: fundamental, practical and innovative. Such a division depends on the target task, the degree of dependence on nature or industrial production, the depth and nature of scientific work. The processes of scientific research and development work are presented in Table 1.

Table 1.

Processes of conducting, implementing, and introducing fundamental, applied, and innovative research in various fields^[1].

Fundamental research	Applied research	Innovative research
It is aimed at acquiring new knowledge about the basic laws of nature, society, and human development, as well as their interrelationships. Its characteristics: • The goal is to open new laws of nature, identify connections between phenomena and create new theories. • The main task is to study objective truths, without requiring practical application in the short term. • Result - hypotheses, theories, methods, etc. • The importance of fundamental research is that it forms a theoretical basis that can later serve as a basis for	Aimed at solving certain practical tasks and problems. The goal is to create new technologies, methods, products or services or improve existing ones. Features of Applied Research: • The results obtained are aimed at practical application in the economy, social sphere, technology or other areas of human activity. • Key characteristics: practical orientation, clarity of the tasks set, time-boundedness, measurability of results, commercial or social significance. • The results of applied research can take various forms: new technologies, products, methods, algorithms, recommendations, or standards. Technical research is aimed at creating new materials, devices, and production technologies, medical research is aimed at developing new methods for diagnosing, treating, and preventing diseases, and economic research is aimed at studying methods for improving the efficiency of economic activities. Applied research can be classified	It is aimed at acquiring new knowledge and opening up unexplored areas. They are aimed at applying new technologies, using large amounts of data, analyzing statistical models, and significantly improving products. Its characteristics: • It is based on existing knowledge gained from scientific research and practical experience. • Development includes, for example, the development of a specific design of an engineering facility or technical system (design work), the development of new ideas and options for an object at the level of a drawing or other system of symbolic means (project work), and the development of technological processes. * Experimental work-the type of developments associated with the experimental verification of

technological advances and new methodological approaches. Studying the material nature of goods, studying the processes occurring in goods during storage, studying external and internal factors affecting the consumer properties of goods.	according to various criteria: • According to the degree of proximity to practical application - exploratory research aimed at creating a scientific basis for the development of new technologies and development research directly related to the creation of specific technical solutions or products are distinguished. • According to the fields of application - applied research is divided into technical, medical, economic, social, environmental, etc.	the results of scientific research: preparation and testing of experimental samples of new products, obtaining technical and other information and testing them for the time necessary to collect experience. The main goal of the development is to prepare materials for practical research for practical application.
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Design and development belong to both the field of science and the field of technology. This is a scientific work, as it covers creative activities that are based not only on already known skills, standard techniques and practical experience, but also aimed at obtaining new, original solutions in the field of engineering, technology or production organization.

Prospects for fundamental research in the field of artificial intelligence: the emergence of powerful artificial intelligence systems; integration into scientific knowledge models; reducing the energy consumption of artificial intelligence models; development of "spatial artificial intelligence"; creation of models that take into account the individuality of the user; development of methods to identify and eliminate nonlinearities in training data and model architecture, as well as standards for assessing the fairness of artificial intelligence systems for demographics.

The prospects for applied research in the field of artificial intelligence are related to its application in various fields: finance and industry. Below are the areas that are promising in various fields.

a) In the field of finance: increasing popularity of generative models; technology synergy; insurance sector development; automation of routine operations.

b) in industry: autonomous production workshops; predictive diagnostics of equipment; development of new materials; development of multimodal models.

Scientific interests in the field of funding scientific research in the field of "Smart Innovative Technology" artificial intelligence research center, problem detection and fundamental research in the field of technology: development of algorithms for automatic object detection and information

extraction from scattered signals; development of numerical methods for solving complex systems of equations, mainly partial differential equations; creation of automated systems for analyzing complex and dynamic scenarios; automatic control theory; application of control principles based on the study of biological systems; to develop scientific theory on new varieties in agriculture, to manage it and to apply new mathematical methods in the field of cotton cultivation; study of higher-level cognitive processes responsible for human reactions to solving complex problems and making decisions; development of mathematical methods for optimizing complex models; creation of optimal control systems; reliable decision-making.

There is a particular focus on the potential of artificial intelligence to solve economic and financial problems related to financial data analysis, economic and financial modeling, financial fraud, and cybersecurity[5].

Artificial intelligence can be used in various areas of economic activity:

- * in production - optimizing production processes and supply chain management systems, predicting equipment failures and maintenance, and creating autonomous robots to perform routine tasks;

- * scientific institutions - Artificial intelligence is used in the economic activities of scientific institutions to automate intellectual functions such as data analysis, decision-making, training, and adaptation to changing conditions, which are traditionally performed by humans. Artificial intelligence is not only a technological tool, but also a factor that can transform traditional business models, resource management, and strategic decision-making;

- * in education - development of individualized educational programs, automation of assessment of academic achievements, forecasting the most in-demand needs of students, creation of intellectual educational platforms;

- * In the field of information technology - development of intelligent data management systems, creation of intelligent assistants and chatbots, development of systems for automatic analysis of big data, information security and threat detection.

Multidisciplinary integrated enterprises will have good opportunities to increase production volumes, stabilize the financial and economic situation, consolidate existing competitive advantages by combining financial resources, carry out complex R&D, and competitors will have good opportunities for extensive marketing research of their markets[6].

Conclusion. According to the conclusions, the country faces important tasks, such as training personnel in the field of artificial intelligence and investing in startups, as well as helping the republic overcome international challenges in this area. It is also important to ensure the demand for computing power across all sectors; to create and develop a research center in the field of artificial intelligence, and to ensure high rates of implementation of artificial intelligence in economic sectors.

Addressing these challenges requires a balanced approach that includes the development of effective economic mechanisms, security technologies, and international standards, as well as expert discussions on issues related to the introduction of artificial intelligence.

It is necessary to involve young scientists in research work, increase their knowledge, conduct fundamental and applied research, implement scientific developments into practice, and participate in the development of new scientific products.

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