THE ROLE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE MODERN ECONOMY

Bai Yajie

Anatoly I. Smirnov

MGIMO University

Abstract

Today artificial intelligence (AI) is widely used in various sectors of the economy and has a tangible impact on the modern economic system. In a post-pandemic environment, when the global economy is in recession and dire need of recovery, the rapid development of AI is giving a new impetus to economic growth. Generative Artificial Intelligence, launched in November 2022, symbolizes the beginning of a new stage in the development of AI technologies. Since AI possesses great economic potential to modernize traditional industries, raise productivity, and maximize revenues, companies are actively seeking to foster the use of AI in their operations and countries are providing policy support for initiatives to introduce AI into various areas of society. Despite all the benefits of using AI there are cases of irresponsible and malicious use of it, which brings about problems associated with ensuring public security.

Keywords

Artificial intelligence, generative artificial intelligence, economy, risks and threats associated with AI.

KEY STAGES IN THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AND FEATURES OF ITS APPLICATION

As known, artificial intelligence (AI) is the science and technology of creating intelligent machines, especially intelligent computer programs and software, this is related to the similar task of using computers to understand human intelligence [1]. AI is one of the main driving forces of the new technological wave of the fourth industrial revolution. Over the recent year the development of AI has accelerated significantly thereby creating: voice assistants, autonomous cars, smart house systems, smart cities, etc. These are examples of AI application in everyday life, covering a wide range of areas such as finance, education, healthcare and transportation. AI has a tangible impact on social, economic and even military-political security.

In total, society has experienced three industrial revolutions. The First Industrial Revolution, or the Age of Steam (late 18th - early 19th centuries), was characterized by the advent of the steam engine, the transcendental significance of which lay in the large-scale use of machines in production. The Second Industrial Revolution, or Electric Age (late 19th - early 20th century), with its transcendental implications for electricity and production lines, led to large-scale production activities of a human. The third industrial revolution, or Information Age (from the 1960s of XX century) was characterized by the emergence of personal computers and the Internet, as well as the rapid development of information technologies constituting the driving force of economic and social development. The change in production methods brought about by improvements in information and communication technologies driven by AI over the last decade is called the fourth industrial revolution.

At the present stage of the society development AI technologies are of great importance. This term was coined by American scientists J. McCarthy and M. Minsky in 1956 as part of the Dartmouth Summer Research Project on Artificial Intelligence (Dartmouth Conference 1956): “Every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it” [2]. The English mathematician A. Turing in his work “Computing Machines and the Mind” described an empirical test, which later became known as the Turing test, implying that if a person fails to find differences between written texts created by an intelligent machine and a human, then this machine can be considered human intelligence [3].

At the beginning of XXI century the development of information technologies such as big data, cloud computing, the Internet of things and others, combined with the development of AI technologies, which include machine and deep learning, ensured the fast development of AI. The launch of ChatGPT in November 2022, a chatbot developed by OpenAI, marks the beginning of a new stage in the development of AI, that is, the age of generative artificial intelligence (Generative AI). Generative Artificial Intelligence is considered the future of AI, the innovative part of which is that it can simulate the creativity and innovation capabilities of humans to generate new data rather than simply process existing data, which is why it is called next-generation artificial intelligence.

The history of AI development can be divided into two stages: machine learning and deep learning. Machine learning is the application of machine learning technologies, primarily in the first decade of this century, and refers to the process of analyzing big data using algorithms that imitate human learning pattern. Deep learning (a more advanced level of learning), which developed rapidly in the second decade of this century, aimed to simulate the structure of the human brain using complex multi-layer neural networks. Covering areas such as self-driving cars, preventive healthcare, etc., deep learning, compared to

machine learning, requires more computing power for information processing.

Generative artificial intelligence is considered as a future trend in the development of AI which has the following fundamental principle: by receiving and processing a large amount of data, it simulates the computational methods of the neural network of the human brain, understands the features of data generation and uses them to generate new data, including texts, images, music and other forms. For instance, ChatGPT, a typical generative AI application, is an interactive conversational robot based on AI content generation technology that can solve interaction problems between machines and humans, not only generate questions and answers, but also serve as the basis for a wide range of services such as chatbots, question and answer systems, machine translation, which ensures real interaction between users and programs. Such technological modernization not only raises the intellectual level of AI, but also expands the scope of its possible application in business. Generative AI possesses considerable development potential and application capacity for creating new works of art, text and music, editing and enhancing images, creating videos, etc. It is also widely used in design architecture, online games, medical research, development and other fields. In the future its use may contribute to the rapid development of the functional characteristics of search engines.

The fundamental difference between traditional AI and generative AI is that traditional AI technologies mainly depend on learning and understanding already generated big data sets, while generative AI is capable of generating entirely new data. The capability of generative artificial intelligence to create original content will certainly lead to dramatic changes in many sectors of the economy, including business.

BENEFITS OF ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR THE ECONOMY

Amid the current slowdown in the global economy, rising costs of living, growing global geopolitical tensions with the simultaneous acceleration of digitalization and intellectualization of industry, the role of artificial intelligence technologies is only increasing. The fourth Industrial Revolution, driven by the use of Internet technologies, big data, cloud computing, AI, blockchain and other ICTs, has undergone profound changes. The rapid development of modern technologies, such as generative artificial intelligence, can in the future bring significant benefits to the economy and transform society in many areas.

The use of AI technologies contributes to the promotion of intelligent, digital, information products, as well as the development of automated control systems in the manufacturing industry, higher production efficiency and modernization of enterprises.

Particularly during the pandemic AI technologies accelerated innovation in everyday life. The COVID-19 outbreak gave impetus to the development of AI products in healthcare, monitoring systems, analysis, epidemic forecasts, detection and testing of antibodies in samples, facial recognition and automatic detection of body temperature, clinical diagnosis of patients, diagnosis, personalized treatment of patients, etc. This significantly reduced social tensions, the loss of medical resources and provided a theoretical basis for improving the efficiency of medical service delivery.

Apart from the healthcare, the use of AI technologies already covers many sectors of the economy, such as transport, manufacturing, agriculture, education and communications. In view of significant social and economic benefits that AI technologies can bring, their wider adoption in business has a positive impact on the economy. The results have become increasingly clear in recent years, with computer vision technologies for facial recognition, traffic sign detection and medical image analysis gaining momentum. Natural language

processing is used for machine translation, intelligent customer service, public opinion analysis, etc. Using machine learning technologies to create Big Data recommendations based on historical behavior patterns of users, identify credit risks, fraud and unusual transactions in banks and financial institutions, and improve risk management.

AI technologies can help companies analyze big data, understand market trends and consumer patterns to develop more accurate business strategies and decisions.

Big data allows companies to create three-dimensional portraits of consumers and collect full information about the customer based on the user's browsing record, items in the cart and purchased products, which allows them to provide customers with better services in line with their preferences, thereby increasing the likelihood of purchase, as well as clients loyalty to the application or website. For instance, when making a purchase on a marketplaces it creates a customer support service and thanks to AI technologies this service can be effected without the help of consultants. A chatbot using natural language processing (NLP) technology can analyze large amounts of data and answer some common questions, including recommendations for appropriate clothing sizes, delivery timing based on distance and suggestions for new products to regular customers, etc. Chatbots operate 24/7 and can answer questions in real time, which greatly frees up labor, improves sales force efficiency and optimizes user experience. Using machine learning algorithms AI helps businesses predict market demand, determine the state of existing supply chains and optimize redundant processes within them. For instance, it helps to intelligently control order processing, implement warehouse management automation, determine procurement costs, transportation methods, etc. by collecting and analyzing record data, as well as monitoring cyclical changes on the market and forecasting industry trends. All this allows enterprises to timely adjust production plans and sales strategy, quickly update product categories, formulate marketing plans, optimize inventory management strategies, save costs and reduce waste. It can be said that supply chain management with AI is completely changing the way businesses make decisions.

AI also plays an important role in the financial industry. Data is the basis of finance and it is AI that can analyze, track large amounts of data and save time and energy resources when integrating and analyzing it. Using AI models to process and analyze large amounts of complex financial data ensures fast and accurate results for making decisions related to the introduction of innovative products, processing and renewal of services.

Moreover, in financial institutions such as banks, insurance organizations and stock exchanges, AI algorithms have demonstrated great capabilities in risk management. This can help financial institutions optimize the process of forecasting and managing these risks using big data analytics and deep learning technology. For instance, AI technology can more precisely and quickly track the slightest fluctuations on financial markets and simultaneously adjust credit scoring and develop personalized asset allocation plans. In addition, AI is capable of raising the security of transactions and maintaining the stable development of the financial market, intelligently identifying various types of risky behavior: misappropriation of funds from credit cards, leakage of clients personal information, financial fraud, etc.

EXPANDING THE APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES

With expanded application of AI, legislators and regulators around the world are seeking to actively support the development and regulation of AI-related activities, recognizing its enormous economic potential and commercial

value.

In recent years Russia has been trying to raise investment in AI. Decree of the Russian President dated October 10, 2019 No. 490 "On the development of artificial intelligence in the Russian Federation" approved the National Strategy for the Development of Artificial Intelligence till 2030 [4]. On October 26, 2023 at the National Russian Forum of Regional Informatization "PROF-IT" Deputy Minister of Economic Development of the Russian Federation Maxim Kolesnikov claimed that a new national strategy for the development of AI would be approved by the end of 2023 to further define the objective of developing artificial intelligence in Russia [5] .

In 2017 China released the "Next-Generation Artificial Intelligence Development Plan." In December 2020 the Chinese Academy of Information and Communications Technology also released the White Paper on the Development of China's Smart Economy [6], which will chart a new era of smart economy with AI as the main driving force. In February 2023 the "General Plan for the Construction of Digital China" [7] was published, containing a number of goals, objectives and strategic activities in digital technologies. In July 2023 temporary measures for the management of generative artificial intelligence services were announced [8], which should ensure compliance of the generated content with "social order and social morality." Chinese IT giants Huawei, Baidu and other technological companies have increased investment in research and development in AI (machine learning, deep learning, etc.), trying to fully leverage the commercial and application potential of Big Data.

In December 2021 the European Commission published drafts of the Digital Services Act and the Digital Markets Act [9], which focus on the regulation of online platforms and digital markets, as well as algorithmic transparency. In June 2023 the European Parliament voted in favor of the AI Act [10], which prohibits or limits the use of high-risk AI systems. In November 2023 London became the venue for the first international summit on AI safety dedicated to the potential risks associated with AI technologies and the prospects for the development of AI at the present stage [11].

The US also attaches great importance to the development of ICT technologies, especially the development of AI as the source of Internet commercialization. On November 9, 2023 the US Department of State published the Enterprise Artificial Intelligence Strategy FY 2024-2025: Empowering Diplomacy through Responsible AI" (EAIS) [12]. This is the first AI strategy designed for corporations. It defines four main goals: using a secure AI infrastructure, developing an AI culture, ensuring the responsible use of AI and leveraging innovation.

CHALLENGES AND THREATS OF ARTIFICIAL INTELLIGENCE TECHNOLOGY

Even though the potential of AI is becoming increasingly visible to society, it may pose hidden dangers and risks. The application of AI in the financial sector still has some limitations regarding the security of personal data, transparency of AI internal mechanisms and methods for interpreting results.

LIMITATIONS ASSOCIATED WITH THE DEVELOPMENT OF INTELLICTUALIZATION OF ARTIFICIAL INTELLIGENCE

Big Data provides the foundation for AI algorithms and computing power, and the quantity and quality of such data are key determinants of the accuracy and reliability of AI systems, raising requirements for the information

needed for computing processes. Without the right learning process, AI algorithms cannot be trained properly, making accurate predictions or decision-making difficult. In any business it is important to ensure the competitiveness of the enterprise and protect the confidentiality of client information. The high probability of information leakage and significant market volatility complicate the process of collecting and analyzing relevant data in AI models, which affects the accuracy and stability of training, as well as the computational results of AI models. Collecting inaccurate and/or insufficient data may result in incorrect financial or tax summary reports, which has a negative impact on company performance.

Data generation and decision-making in AI models are a lengthy procedure that includes data collection and pre-processing, model training and optimization, data computation, model evaluation and testing. Each link in the computing process can be used not for the purpose intended or even destroyed. For instance, cybercrime, cyberterrorism, cyberattack - all these actions in computing processes involve the falsification or theft of confidential information, causing great economic damage.

DATA SECURITY ISSUES

The challenges associated with the world economic downturn have coincided with the development of AI. In particular, ChatGPT, which is a powerful generative artificial intelligence tool, enables interaction between humans and AI. However, the creation of entirely new intelligent security systems has produced a fertile environment for the irresponsible and malicious use of AI. All this has contributed to the development of areas related to the security of corporate data, stabilization of the financial market, economic security, etc.

Without systematic and comprehensive regulation, the active development of AI can cause destabilization of the economy through a targeted information and psychological impact on the consciousness of society. As AI develops, the negative implications associated with its use loom larger: downloading malware, leaking personal data, as well as the spread of false content and fishing websites. All this threatens global economic security and increases the likelihood of new financial crises.

For instance, fishing attacks involve creating fake emails and websites to commit fraudulent activities. Fraudsters seek to entice users to download malware or disclose sensitive information for purposes of identity theft or financial fraud, stock market manipulation, and even espionage. Deep Fake involves the generation of synthetic algorithms to create texts, images, audio, video, virtual scenes and other information. It is widely used in the movie and television industry, media, education and other fields, and as a fraud tool as well.

SOCIAL PROBLEMS

1. The intellectualization of enterprises has led to an urgent need for the training of highly qualified personnel.

AI technologies are becoming important production tools that can improve the efficiency of production and operations. In the coming years AI could replace many jobs, including taxi drivers, translators, factory floor workers, call center operators, etc. The demand for qualified personnel is increasing, i.e. we witness higher requirements for the level of education and qualifications of workers to reduce costs and raise operational efficiency. Companies are trying to find a balance between providing jobs and using AI as they strive to adapt to new labor relations in the digital age.

2. Uneven development of society and regions caused by the development of artificial intelligence.

Even during the third industrial revolution the development of science and the introduction of technology into the daily life of mankind caused a rise in the gap between the poor and the rich.

As AI, in particular generative AI, develops, traditional labor is being displaced in developing regions, leading to frictional unemployment among low-skilled workers. In the case of highly skilled workers in construction, law, healthcare, etc., AI can be used as an additional tool to create added value, improve production efficiency and raise wages, causing further inequality in society.

The introduction of AI requires certain financial and technical support. Countries and regions with high scientific and technological development have greater capabilities for investment in R&D, and also have a more highly skilled labour, which contributes to their economic, scientific and technological development. Whereas less developed countries do not possess such a potential. All this not only aggravates social inequality, but also impedes the implementation of the UN sustainable development goals till 2030. Less developed countries are forced to raise investment in R&D to prevent differentiation in socio-economic development between regions, which is very difficult.

CONCLUSION

Since AI offers the opportunity to simplify many vital processes, an increasing number of companies around the world are using AI technologies to improve their operational efficiency, strengthen data analytics and predictive capabilities, and drive innovation and economic growth. However, it is worth considering the negative implications for society caused by its improper use. Although AI is playing an increasingly important role in modern economy, the pace of its further development remains unpredictable. One thing is certain: the transition to the mass use of AI is a complex and lengthy process. Researchers face a long-term challenge related to the proper use and regulation of AI. Governments and enterprises must pay close attention to the problems and challenges associated with the development of AI and take active measures to solve them, since artificial intelligence technologies are likely to be used in all sectors of the economy in the foreseeable future.

REFERENCES

1. John McCarthy. 2007. What is Artificial Intelligence? URL: https://www-formal.stanford.edu/jmc/whatisai.pdf (Accessed 2 November 2023).

2. Council of Europe. History of Artificial Intelligence. URL: https://www.coe.int/en/web/artificial-intelligence/history-of-ai (Accessed 3 November 2023).

3. Turing A. Computing machines and intelligence [trans. from English K. Koroleva]. M.: Publishing house «AST». 2018. P. 128.

4. Decree of the President of the Russian Federation dated October 10, 2019 No. 490 “On the development of artificial intelligence in the Russian Federation.” URL: http://www.kremlin.ru/acts/bank/44731 (Accessed 7 November 2023).

5. TASS. The Ministry of Economic Development expects that the updated strategy for the development of AI will be approved by the end of the year. URL: https://tass.ru/ekonomika/19122369 (Accessed 12 November 2023).

6. White paper on the development of China’s smart economy. New infrastructure, new opportunities: URL: https://www.cdrf.org.cn/jjh/pdf/zhonggu

ozhinengjingjixinfazhan1011.pdf (Accessed 13 November 2023).
7. State Council of the People's Republic of China. General plan for the construction of digital China. URL: https://www.gov.cn/zhengce/2023-02/27/content_5743484.htm (Accessed 15 November 2023).
8. Cyberspace Administration of the People's Republic of China. Interim measures for managing generative artificial intelligence services. URL: http://www.cac.gov.cn/2023-07/13/c_1690898327029107.htm (Accessed 16 November 2023).
9. News European Parliament. EU Digital Markets Act and Digital Services Act Explained. URL: https://www.europarl.europa.eu/news/en/headlines/society/20211209STO19124/eu-digital-markets-act-and-digital-services-act-explained (Accessed 19 November 2023).
10. News European Parliament. EU AI Act: first regulation in artificial intelligence. URL: https://www.europarl.europa.eu/news/en/headlines/society/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence (Accessed: 20 November 2023).
11. GOV.UK. AI Safety Summit 2023. URL: https://www.gov.uk/government/topical-events/ai-safety-summit-2023 (Accessed 21 November 2023).
12. U.S. Department of State. Enterprise Artificial Intelligence. Strategy FY 2024-2025. URL: https://www.state.gov/wp-content/uploads/2023/11/Department-of-State-Enterprise-Artificial-Intelligence-Strategy.pdf (Accessed 21 November 2023).

About the authors:

Bai Yajie – independent consultant, People's Republic of China.

Anatoly I. Smirnov – Doctorate PhD in Historical Sciences, Professor at the Department of Applied Analysis of International Problems (DAAIP), Chief Researcher at the Center for International Information Security and Science and Technology Policy, MGIMO Russia, 119454, Russia, Moscow, 76 Vernadsky Avenue.

Conflict of interest: the authors declare no conflict of interest.

Funding: the study was not sponsored.

For references: Bai Yajie, Anatoly I. Smirnov (2023). The role of artificial intelligence technologies in the modern economy. 3(5), pp. 119-126

Submitted for publication: 22 November 2023 Accepted for publication: 7 December 2023