DEVELOPING UKRAINIAN ENTERPRISES USING NEURAL NETWORKS

Pohorelova K.A., Pogorelov Y.S.

РОЗВИТОК УКРАЇНСЬКИХ ПІДПРИЄМСТВ ІЗ ВИКОРИСТАННЯМ НЕЙРОМЕРЕЖ

Погорелова К.А., Погорелов Ю.С.

The article explores the features of using neural networks for the development of Ukrainian enterprises. It examines the theoretical foundations of neural networks, their history, types, and examples of application in various industries. Special attention is given to analyzing the factors influencing enterprise development, such as technological innovations, economic conditions, organizational changes, competition level, and market conditions. It is shown that technological progress is a key factor in the development of enterprises in the modern world. The current state of development of Ukrainian enterprises is investigated in the context of adapting to new economic conditions, particularly during the war. The war in Ukraine significantly affects the economy, including the business sector. Internal challenges include political instability, economic reforms, workforce shortages due to mobilization, power outages, and the need for modernization of production facilities. External factors include global competition, the influence of international markets, and economic sanctions. Despite the challenging conditions, Ukrainian enterprises have growth opportunities through the implementation of the latest technologies, such as neural networks. The main challenges and opportunities for Ukrainian business are analyzed, and the directions for using neural networks for enterprise development are proposed for each development factor, considering the specifics of business operations in Ukraine. Specific examples of successful implementation of neural networks in the banking sector (PrivatBank), IT companies (SoftServe), and the agro-industrial complex (MHP) are provided. The article analyzes the advantages and disadvantages of using neural networks, such as increased efficiency, forecasting accuracy, service personalization, risk reduction, and challenges related to high costs, integration complexity, lack of qualified personnel, and data quality dependency. The prospects for enterprise development using neural networks are considered: productivity improvement, product and service quality enhancement, efficient resource management, risk reduction, innovative development, market adaptation, and resilience support. It is proven that the use of neural networks has significant potential for transforming enterprises, making them more efficient, flexible, and innovative.

Keywords: *neural networks, enterprise development, technological innovations, automation, economic conditions, competitiveness.*

Introduction. In the modern world, Ukrainian enterprises face numerous challenges arising from the unpredictable dynamics of the global market and the complexities of the internal economic environment. These conditions require not only adaptability but also an innovative approach to business management, ensuring that enterprises can effectively respond to changes and seize new opportunities for growth.

One of the promising technologies that is gaining increasing traction in enterprise management and development is the use of neural networks. These artificial intelligence systems, ranging from image recognition to machine learning and media content generation, demonstrate impressive capabilities in optimizing business processes, analyzing large volumes of data, enhancing marketing strategies, and assessing risks.

The purpose of this article is to outline the fundamental principles of using neural networks for the development of domestic enterprises. We will examine the theoretical aspects of neural networks, their history, and key achievements. Additionally, we will analyze specific examples of the application of these technologies in various enterprise activities, focusing on marketing, risk assessment, and business process improvement. We will also evaluate the potential advantages and risks of implementing

neural networks, providing examples of successful cases and recommendations for Ukrainian enterprises.

Analysis of recent research and publications. Both Ukrainian and international researchers are actively exploring the possibilities of using neural networks in various aspects of enterprise activities. For instance, a study conducted by Maria Pankova and Kazimierz Nowak demonstrates that one of the main factors influencing enterprise development is technological innovation. The implementation of cutting-edge technologies, such as neural networks, can enhance the efficiency of production processes, automate routine tasks, and improve the quality of products or services [1, 12].

Maria Pankova, Anna Kwilinska, Natalia Dalevska, and Volodymyr Khobta in their research on modeling the level of enterprise resource security using artificial neural networks demonstrated how neural networks can improve managerial decisions, providing more accurate and objective assessments of various efficiency parameters [10]. At the international level, studies also emphasize the importance of neural networks in business. Ian Goodfellow, Yoshua Bengio, and Aaron Courville in their book "Deep Learning" have shown how big data and neural networks can contribute to the development of enterprise knowledge management strategies. The researchers found that the integration of neural networks significantly enhances the efficiency of collecting, analyzing, and utilizing knowledge within an organization [1,2].

An important study conducted by A. Radford, J. Wu, R. Child, D. Luan, D. Amodei, and I. Sutskever demonstrates the application of neural networks for forecasting in various enterprise management systems. This approach opens up new possibilities for optimizing resource consumption and increasing energy efficiency [5].

These and other studies confirm that neural networks are no longer just theoretical tools but are becoming practical means for enhancing the competitiveness and efficiency of enterprises. They pave the way for new forms of management, market analysis, and product development.

Neural networks are a modern powerful multipurpose tool. Skillful use of such a tool can achieve significant results, create a competitive advantage for the enterprise, and ensure its development. The idea of creating neural networks emerged in the mid-20th century, but this technology has seen significant development since the early 2000s due to the increase in computational power and the advancement of learning algorithms. The free use of the concepts of enterprise development and neural networks requires clarification of their content. Let's start with the definition of the term "neural network." Various definitions of this term used in scientific literature since 1994 are provided in Table 1 below.

In this article, we propose defining neural networks as a computer model of human thinking and learning, created using a set of interconnected algorithmic elements that enable the processing of large amounts of information and solving complex tasks of analysis and forecasting. These networks can be used for the development of business, science, and technology.

In the field of artificial intelligence, there are various types of neural networks, each performing its functions. Some neural networks are simple and help solve basic tasks, while others, more complex, analyze data sequences or process images. There are also special neural networks that generate new data based on existing ones. The typology of neural networks in terms of their applications is summarized in Table 2 [3,5,8-10].

Table 1

Definitions of the term "neural network"

Definition of Neural Network	Author/Source
A neural network is a system with a large number of elements that mimics the structure and functioning of the biological brain to solve complex tasks.	B. Widrow, D.E. Rumelhart, M.A. Lehr [8]
A neural network is a set of interconnected algorithmic elements capable of learning and adapting to new data to solve various tasks.	K.A. Smith, J.N.D. Gupta [3]
A neural network is artificial intelligence consisting of a large number of artificial neurons capable of processing information through their interactions.	C. Yubo [5]
A neural network is an algorithmic structure that learns from examples and is used to automate complex tasks of analysis and forecasting.	M. Pankova, A. Kwilinski, N. Dalevska, V. Khobta [10]
Neural networks are computer models that attempt to replicate human thought and learning processes using a large number of interactive nodes.	A. Vellido, P.J.G. Lisboa, J. Vaughan [9]

Table 2

Main Types of Neural Networks and Their Applications

Type of Neural Network	Description	Application	Examples
Perceptron	The simplest form of neural network, consisting of a single layer of neurons.	Classification of simple linearly separable data.	-
Multilayer Perceptron (MLP)	Consists of multiple layers of neurons: input, hidden, and output layers.	Pattern recognition, forecasting, classification of complex data.	OpenAI GPT, Google BERT
Convolutional Neural Networks, CNN	Use convolutional layers to automatically extract features from input data.	Image and video analysis, natural language processing.	AlexNet, VGGNe, ResNet, Luma AI
Recurrent Neural Networks, RNN	Have feedback loops, allowing them to process sequential data	Time series analysis, speech and text processing.	LSTM, GRU
Long Short-Term Memory, LSTM	A special type of RNN that can retain information for extended periods.	Time series modeling, machine translation, speech recognition.	-
Generative Adversarial Networks, GAN	Consist of two networks: a generator and a discriminator, which compete with each other.	Image and video generation, creation of synthetic data.	DCGAN, StyleGAN

Table 3

Definitions of the Term "Enterprise Development"

Author	Definition
Brian M. Barnes	Enterprise development is defined as a sequential process of improving its organizational, production, and management structures to achieve strategic goals
Kazimierz Nowak	Enterprise development is the systematic improvement of all aspects of its activities, including productivity, efficiency, and competitiveness, through the implementation of innovations and technologies
Maria Pankova	Enterprise development involves analyzing and forecasting the level of resource security of the enterprise, using neural networks to optimize processes and enhance the efficiency of managerial decisions
Peter Drucker	Enterprise development is the organization's ability to continuously update its resources and processes to effectively respond to market changes and maintain competitiveness

However, in this article, we will focus on neural networks that work with text and data. These neural networks are crucial for analyzing large volumes of textual information, which can be useful for business, science, and technology.

Research on the development of Ukrainian enterprises using neural networks requires defining the concept of enterprise development. Table 3 presents several classic definitions from Ukrainian and international researchers [1, 5, 10, 11].

Within the framework of this article, we propose understanding enterprise development as a process of comprehensive changes aimed at adapting to external conditions, optimizing internal processes, and ensuring sustainable economic growth. Based on this definition, we can assert that business development depends on many internal and external factors that interact with each other and influence the overall efficiency of the enterprise. Continuing our research, we can identify the main factors influencing enterprise development (Figure).

Fig. Main Factors Influencing Enterprise Development

Many researchers, including Kazimierz Nowak and Maria Pankova, note in their studies that one of the main factors influencing enterprise development is technological innovation [5,10]. The implementation of cutting-edge technologies, such as neural networks, can enhance the efficiency of production processes, automate routine tasks, and improve the quality of products or services.

Economic conditions also significantly impact enterprise development. Macroeconomic indicators such as inflation, exchange rates, unemployment rates, and interest rates greatly affect enterprise activities. Favorable economic conditions promote business growth, while economic crises can lead to significant difficulties [9,11].

Organizational changes play an important role as well. The internal structure of an enterprise, its culture, and managerial approaches influence its development. Organizational changes aimed at improving efficiency may include the reorganization of structural units, the introduction of new management methods, and the enhancement of employee qualifications [4,5].

The level of market competition determines the development strategies of an enterprise. High competition stimulates enterprises to implement innovations, improve product quality, and reduce costs [9,11].

Market conditions, including demand for the enterprise's products or services, changes in consumer preferences, and general market trends, are crucial for business development. Enterprises must quickly adapt to market changes to remain competitive [4,10].

As we can see from the analysis above, one of the main factors influencing enterprise development is technological progress. Let's consider the relationship between technological progress and enterprise development in more detail. It is reasonable to assume that technological progress is a key factor in the development of enterprises in the modern world. It affects all aspects of business activity, from production processes to strategic

planning and resource management. One of the most important achievements of technological progress is the accessibility and widespread adoption of neural networks, which play a crucial role in the modernization and optimization of business processes. Due to the reduction in computing costs and the development of software, neural networks have become accessible to a wide range of enterprises, regardless of their size and industry. This has significantly expanded the possibilities of their use in various business sectors, contributing to increased efficiency and innovation.

Let's explore the potential applications of neural networks in various aspects of enterprise activity. It is worth noting that the following analysis is general and aims to highlight the main directions of using neural networks for enterprise development. Undoubtedly, there are many more such directions, especially considering the diversity of artificial intelligence tools and the possibility of creating personalized neural networks.

One of the main aspects of the impact of technological progress on enterprises is the increase in production process efficiency. The introduction of new technologies, such as neural networks, allows for the automation of routine operations, reducing the time required to complete tasks and lowering production costs. For example, the use of neural networks for optimizing logistics chains can significantly reduce transportation and storage costs, directly impacting business profitability.

Innovative technologies also contribute to improving the quality of products and services. The use of neural networks to analyze large volumes of data allows for more accurate identification of consumer needs and preferences, which, in turn, facilitates the creation of products that better meet market demands. For example, neural networks can be used to enhance quality control in manufacturing, enabling quicker detection of defects and the implementation of appropriate corrective actions.

Technological progress also impacts the optimization of managerial decisions. Using neural networks and other innovative technologies for data analysis helps enterprise leaders make more informed decisions based on accurate forecasts and market trend analyses. For instance, neural network-based models can predict changes in product demand, allowing for more efficient production planning and marketing campaigns.

The implementation of technological innovations can be a crucial factor in enhancing the competitiveness of enterprises. Companies that actively use the latest technologies can adapt more quickly to market changes, offer innovative products and

services, and manage resources more effectively. This enables them to secure leading positions in their industry and increase their market share.

Returning to the key topic of our research, we need to examine the current state of development of Ukrainian enterprises, which are experiencing a challenging period of adaptation to new economic conditions driven by both internal and external factors. The war in Ukraine is a key factor significantly impacting all aspects of the country's economic life, including business development. On the one hand, internal challenges include political instability, economic reforms, and the need for modernization of production capacities. On the other hand, external factors such as global competition, the influence of international markets, and integration into the global economy also significantly affect the development of Ukrainian enterprises.

Internal Factors

1. War and Political Instability: The war in eastern Ukraine creates significant obstacles for businesses, including the destruction of infrastructure, loss of assets, disruptions in logistics, and instability in the financial sector. Continuous political changes and conflicts create an unpredictable business environment, complicating long-term planning and investments [12].

2. Labor Shortage and Uncertainty Due to Mobilization: The war has caused a significant outflow of the workforce, with many employees being mobilized or forced to leave the country. This creates substantial challenges for enterprises facing a shortage of qualified personnel and uncertainty in retaining their workforce [13].

3. Economic Reforms: Ongoing economic reforms aimed at market liberalization, improving the business climate, and combating corruption have a significant impact on enterprise development. Although these reforms create growth opportunities, their implementation is often accompanied by short-term difficulties [14].

4. Challenges Related to Power Outages: Power outages due to infrastructure damage or resource shortages lead to production downtimes and reduced productivity. Enterprises are forced to invest in costly generators and other power sources to ensure continuous operation [15].

5. Modernization of Production Capacities: Many Ukrainian enterprises require updates and modernization of their production capacities to enhance competitiveness. This includes the implementation of new technologies, such as neural networks, for automating and optimizing production processes [16].

6. Rising Production Costs Amid Decreasing

Consumer Purchasing Power: Inflation and rising resource costs increase the production cost of goods, while consumer purchasing power declines due to the economic crisis. This creates additional pressure on enterprises, forcing them to seek ways to optimize costs and improve efficiency [17].

External Factors.

Global Competition: Ukrainian enterprises face intense competition in international markets. This requires continuous improvement of products and services, as well as the implementation of innovative technologies to maintain competitive advantages [18].

International Markets: Integration into the global economy opens new opportunities for export and cooperation but also requires compliance with international standards and regulations [19].

Economic Sanctions: Economic sanctions imposed on Russia and other countries have both positive and negative impacts on Ukrainian enterprises. On the one hand, it opens new opportunities in the domestic market; on the other hand, it limits access to certain external markets and resources [20].

The overall economic state of Ukrainian enterprises is challenging but full of growth opportunities. The implementation of cutting-edge technologies, such as neural networks, and adaptation to new economic conditions contribute to enhancing the competitiveness and resilience of businesses.

Having analyzed the general factors affecting enterprise development and the specific factors influencing the current state of Ukrainian enterprises, we can identify the main directions for using neural networks to develop Ukrainian enterprises (Table 4).

In the current conditions of developing Ukrainian enterprises, the implementation of technological innovations, such as neural networks, is a crucial component of their success. These innovations can significantly impact various aspects of business, from increasing the efficiency of production processes to optimizing managerial decisions. Table 4 illustrates the main factors influencing enterprise development, the tasks facing enterprises, and the solutions that can be implemented using neural networks.

The table consists of five main sections, each covering a separate factor of enterprise development: technological innovations, economic conditions, organizational changes, level of competition, and market conditions. For each section, specific tasks that enterprises face are presented, along with solutions that can be implemented using neural networks. Undoubtedly, the listed tasks are not exhaustive; their main purpose is to clearly demonstrate the possibilities of using neural networks to improve the efficiency and competitiveness of enterprises in various industries.

Table 4 can serve as a guide for business leaders and managers, demonstrating how neural networks can help solve key tasks and improve enterprise performance. By implementing cutting-edge technologies, enterprises can not only increase their productivity but also better adapt to market changes and manage their resources more efficiently.

For the creation of this table, real cases of neural network applications in Ukrainian enterprises were summarized. Let's examine them in more detail.

When it comes to analyzing the current level of neural network implementation, it is clear that the adoption of neural networks in Ukrainian enterprises varies depending on the industry and the size of the company. Large corporations and tech startups are the leaders in using neural networks, while small and medium-sized enterprises often face challenges due to limited resources and insufficient technical expertise. Currently, the following sectors exhibit a high level of neural network implementation:

1. IT and Technology: The IT sector in Ukraine is one of the most progressive in adopting neural networks. Companies use neural networks for software development, data analysis, and automation of various processes [21].

2. Financial Services: Banks and financial institutions use neural networks for risk analysis, fraud detection, and market trend forecasting. This helps to increase the accuracy of financial forecasts and reduce risks [22].

3. Manufacturing and Logistics: The use of neural networks in manufacturing and logistics allows for the optimization of supply chains, increased productivity, and cost reduction. Automation of quality control and demand forecasting also contribute to increased efficiency [16].

Let's consider examples of successful use of neural networks in Ukrainian enterprises in more detail. Ukrainian enterprises are actively implementing neural networks to optimize various aspects of their activities. Here are some examples of successful use of neural networks in different industries. PrivatBank, the largest commercial bank in Ukraine, is a leader in using neural networks to improve financial services [23].

Table 4

Main Directions for Using Neural Networks for the Development of Ukrainian Enterprises

Enterprise Development Factor	Task for Enterprises	Neural Network Solution
Technological Innovations	Automate production processes	Use neural networks to automate routine operations, reducing manual labor costs and increasing productivity
	Analyze large volumes of data	Neural networks can process large datasets to identify trends and patterns, aiding in informed decision-making.
	Optimize logistics chains	Neural networks help optimize delivery routes and inventory management, reducing logistics costs.
	Improve product and service quality	Enhancing quality control with neural networks allows for the quick detection of defects and implementation of corrective actions.
Economic Conditions	Forecast macroeconomic indicators	Neural networks can analyze economic data to forecast inflation, exchange rates, unemployment rates, and interest rates.
	Analyze market trends	Using neural networks to analyze market data helps identify trends and respond to market changes.
	Manage financial risks	Neural networks assist in identifying potential financial risks and developing strategies to mitigate them.
	Optimize costs	Data analysis for optimizing production costs and resource management.
Organizational Changes	Optimize managerial decisions	Neural networks analyze internal enterprise data to improve managerial decisions.
	Analyze internal processes	Identifying inefficient processes and developing ways to optimize them.
	Improve structural units	Implementing new management methods to enhance the efficiency of departments.
	Increase employee qualifications	Using neural networks to analyze training needs and develop programs for employee skill enhancement.
Level of Competition	Analyze competitive environment	Neural networks analyze competitor data to develop strategies for competitive advantage.
	Develop competitive advantage strategies	Using analytical data to create innovative products and services.
	Adapt to market changes	Forecasting market changes and quickly adapting to them.
	Forecast demand	Using neural networks to predict changes in demand for products and services.
Market Conditions	Analyze consumer preferences	Using neural networks to analyze consumer behavior and create products that meet their needs.
	Personalize marketing campaigns	Developing targeted marketing strategies based on consumer data analysis.
	Create products according to market demands	Using analytics to create products that align with current market trends.
	Predict market trends	Forecasting market changes to develop strategies that keep the enterprise competitive.

Thanks to neural networks, the bank has implemented several innovative systems:

1. Fraud Detection: Neural networks help identify suspicious transactions in real-time, enabling quick responses to potential threats and protecting clients' funds. This significantly enhances the security of banking operations.

2. Personalization of Banking Services: Analyzing client data with neural networks allows for the creation of personalized offers that meet the individual needs of each client. This increases customer satisfaction and loyalty to the bank.

3. Optimization of Credit Decisions: Neural networks analyze credit histories and client behaviors for more accurate risk assessments, enabling the bank to make well-informed decisions regarding loan issuance [23].

SoftServe, one of the largest IT companies in Ukraine, actively uses neural networks to develop innovative solutions in various industries [24]:

1. Medical Technologies: The company has developed a neural network system for analyzing medical images, helping doctors diagnose diseases more quickly and accurately. This improves the quality of medical services and reduces treatment costs.

2. Retail: Neural networks are used to analyze customer data and optimize product assortments. This enhances the effectiveness of marketing campaigns and increases sales.

Financial Services: SoftServe implements neural network-based solutions for analyzing financial risks and forecasting market trends, helping financial institutions make more informed decisions [24].

MHP (Myronivsky Hliboproduct), a leading agribusiness holding in Ukraine, uses neural networks to optimize production processes [25]:

1. Yield Forecasting: Neural networks analyze agronomic data and climatic conditions to predict the yield of various crops. This allows for more effective planning of sowing operations and resource management.

2. Supply Chain Optimization: Using neural networks to analyze logistics data helps optimize product delivery routes, reduce transportation costs, and ensure timely supply of goods.

3. Quality Control Automation: Neural networks help identify product defects at different stages of production, allowing for quick response to issues and ensuring high quality of the final product [25].

Based on the examples considered, we can conclude that the implementation of neural networks in Ukrainian enterprises across various industries already shows significant positive results. They contribute to the increased efficiency of production processes, improved quality of products and services, and optimized logistics and managerial decisions. Neural networks enable enterprises to adapt more quickly to market changes, enhance their competitiveness, and manage resources efficiently.

Neural networks, a subset of artificial intelligence, can process large volumes of data, identify patterns, and make decisions based on the results. This opens up new opportunities for process automation, efficiency enhancement, and service quality improvement. However, the implementation of neural networks in business also comes with certain challenges and risks. Companies face high implementation costs, the complexity of integrating new technologies into existing processes, and the need for qualified personnel to maintain and develop these systems. Additionally, the effectiveness of neural networks largely depends on the quality of the data they work with. Let's outline the advantages of using neural networks in business [8,9].

1. Increased Efficiency: Automation of routine tasks reduces labor costs and increases productivity. Neural networks can perform tasks faster and more accurately than humans, leading to significant improvements in business process efficiency.

2. Forecast Accuracy: Neural networks can analyze large volumes of data and identify patterns, improving the accuracy of forecasts and decision-making. This allows businesses to anticipate market changes, respond to trends, and plan their actions more effectively.

3. Personalized Services: Analyzing customer data with neural networks enables the creation of personalized offers, increasing customer satisfaction and loyalty. For example, recommendation systems in online stores or personalized marketing campaigns.

4. Risk Reduction: Neural networks help identify anomalies and potential threats, reducing the risks of fraud and other financial losses. This is particularly important in the financial sector, where such systems can significantly decrease instances of fraud.

5. Optimization of Operational Processes: Neural networks can optimize inventory management, logistics, production, and other operations, reducing costs and increasing the efficiency of enterprise activities.

6. Improvement in Product and Service Quality: Using neural networks for quality control helps detect product defects at early stages of production, improving the quality of the final product and reducing waste.

7. Acceleration of Innovations: Neural networks facilitate faster implementation of innovations by enabling rapid testing and evaluation of new ideas and products based on data analysis. This helps companies stay competitive and quickly adapt to market changes.

However, besides the advantages, there are also disadvantages and challenges that Ukrainian enterprises face when implementing neural networks. Let's examine these disadvantages in more detail [5,8,9]:

1. High Implementation Costs: Implementing neural networks requires significant investment in technical infrastructure and staff training. This can be particularly challenging for small and medium-sized enterprises with limited resources.

2. Integration Complexity: Integrating neural networks into existing business processes can be complex and resource-intensive. This involves not only technical integration but also changing workflows and adapting staff to new methods.

3. Lack of Qualified Personnel: A shortage of specialists with experience in neural networks can hinder successful implementation. Training and retaining such specialists can be costly and time-consuming.

4. Dependence on Data Quality: Effective neural networks require large volumes of high-quality data, which are not always available. Poor data quality can lead to inaccurate forecasts and incorrect decisions, negatively impacting the business.

5. Confidentiality Issues: Using neural networks to process personal data can raise concerns about data privacy and security. Companies must ensure the protection of client data in accordance with regulatory requirements and standards.

6. Risk of Over-Automation: Excessive automation can lead to the loss of the human element in processes, which can be detrimental in situations where intuition and creative approaches are essential.

7. Need for Constant Updating: Neural network technologies evolve rapidly, and companies must continually update their systems and algorithms to stay competitive. This requires additional resources and investments.

In this analysis, the main advantages and disadvantages of using neural networks in business have been considered. Advantages include increased efficiency, forecasting accuracy, service personalization, risk reduction, optimization of operational processes, improved product quality, and accelerated innovation. At the same time, the disadvantages include high implementation costs, integration complexity, lack of qualified personnel,

dependence on data quality, confidentiality issues, the risk of over-automation, and the need for constant updating.

The implementation of neural networks in Ukrainian enterprises opens significant opportunities for enhancing efficiency, competitiveness, and innovation. Neural networks can help automate routine processes, improve the quality of products and services, reduce risks, and optimize managerial decisions. The application of this technology is especially relevant in the current environment where businesses face numerous challenges such as economic crises, political instability, and military conflicts. Based on the aforementioned points, we can outline the prospects for the development of Ukrainian enterprises using a variety of artificial intelligence technologies [1,5,8,9]:

1. Productivity Growth: Automation and optimization of production processes using neural networks will reduce costs and increase labor productivity.

2. Improvement in Product and Service Quality: Using neural networks for quality control and data analysis will help create products that better meet consumer needs.

3. Effective Resource Management: Optimizing managerial decisions and logistics will contribute to more efficient use of enterprise resources.

4. Risk Reduction: Neural network-based systems can detect fraud, forecast risks, and help businesses make well-founded financial decisions.

5. Innovative Development: Neural networks facilitate the faster implementation of new ideas and technologies, allowing businesses to stay at the forefront of the market.

6. Adaptation to Market Changes: Neural networks help analyze market trends and consumer preferences, enabling businesses to adapt more quickly to market changes.

7. Support for Enterprise Resilience: The use of advanced technologies helps businesses better cope with challenges and unforeseen circumstances, ensuring their resilience and long-term development.

Thus, neural networks have significant potential to transform Ukrainian enterprises, making them more efficient, flexible, and innovative.

Conclusions. The implementation of neural networks in Ukrainian enterprises opens significant opportunities for enhancing efficiency, competitiveness, and innovation. Neural networks can help automate routine processes, improve the quality of products and services, reduce risks, and optimize managerial decisions. The application of this technology is especially relevant in the current

environment where businesses face numerous challenges such as economic crises, political instability, and military conflicts.

Thus, increasing productivity through automation and optimization of production processes using neural networks will reduce costs and enhance labor productivity. Using neural networks for quality control and data analysis will help create products that better meet consumer needs. Optimization of managerial decisions and logistics will contribute to more efficient use of enterprise resources. Neural network-based systems can detect fraud, forecast risks, and help businesses make well-founded financial decisions. Neural networks facilitate the faster implementation of new ideas and technologies, allowing enterprises to stay at the forefront of the market. As demonstrated by real-life cases from PrivatBank, SoftServe, and MHP, neural networks are already helping analyze market trends and consumer preferences, enabling businesses to adapt more quickly to market changes. The use of advanced technologies helps enterprises better cope with challenges and unforeseen circumstances, ensuring their resilience and long-term development.

Thus, neural networks have significant potential to transform Ukrainian enterprises, making them more efficient, flexible, and innovative. It is crucial for enterprises to understand both the advantages and challenges of implementing this technology and develop strategies that will allow them to maximize its potential.

R e f e r e n c e s

1. Goodfellow I., Bengio Y., Courville A. Deep Learning / I. Goodfellow, Y. Bengio, A. Courville. – MIT Press, 2016. – 800 p.
2. LeCun Y., Bengio Y., Hinton G. Deep Learning / Y. LeCun, Y. Bengio, G. Hinton // Nature. – 2015. – Vol. 521, No 7553. – pp. 436-444.
3. Schmidhuber J. Deep Learning in Neural Networks: An Overview / J. Schmidhuber // Neural Networks. – 2015. – Vol. 61. – pp. 85-117.
4. Hochreiter S., Schmidhuber J. Long Short-Term Memory / S. Hochreiter, J. Schmidhuber // Neural Computation. – 1997. – Vol. 9, No 8. – pp. 1735-1780.
5. Radford A., Wu J., Child R., Luan D., Amodei D., Sutskever I. Language Models are Unsupervised Multitask Learners / A. Radford, J. Wu, R. Child, D. Luan, D. Amodei, I. Sutskever. – OpenAI, 2019. – [Електронний ресурс] – Режим доступу: https://cdn.openai.com/better-language-models/language_models_are_unsupervised_multitask_learners.pdf
6. He K., Zhang X., Ren S., Sun J. Deep Residual Learning for Image Recognition / K. He, X. Zhang, S. Ren, J. Sun // Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR). – 2016. – pp. 770-778.
7. Goodfellow I., Pouget-Abadie J., Mirza M., Xu B., Warde-Farley D., Ozair S., Courville A., Bengio Y. Generative Adversarial Nets / I. Goodfellow, J. Pouget-Abadie, M. Mirza, B. Xu, D. Warde-Farley, S. Ozair, A. Courville, Y. Bengio // Advances in Neural Information Processing Systems. – 2014. – Vol. 27.
8. Widrow B., Rumelhart D.E., Lehr M.A. Neural Networks: Applications in Industry, Business and Science / B. Widrow, D.E. Rumelhart, M.A. Lehr // Communications of the ACM. – 1994. – Vol. 37, No 3. – pp. 93-105. doi:10.1145/175247.175257
9. Vellido A., Lisboa P.J.G., Vaughan J. Neural networks in business: a survey of applications (1992–1998) / A. Vellido, P.J.G. Lisboa, J. Vaughan // Expert Systems with Applications. – 1999. – Vol. 17, No 1. – pp. 51-64.
10. Pankova M., Kwilinski A., Dalevska N., Khobta V. Modelling the Level of the Enterprise' Resource Security Using Artificial Neural Networks / M. Pankova, A. Kwilinski, N. Dalevska, V. Khobta // Virtual Economics. – 2023. – Vol. 6, No 1. – pp. 71-91. doi:10.34021/ve.2023.06.01(5).
11. Drucker P. The Essential Drucker / P. Drucker. – New York: HarperCollins, 2001. – 276 p.
12. Pekar, V. The Impact of the War on the Ukrainian Economy / V. Pekar // Ekonomichna Pravda. – 2022. – [Electronic resource] – Access mode: https://www.epravda.com.ua/
13. Ministry of Economy of Ukraine. Labor Market in Wartime Conditions. – Ministry of Economy of Ukraine, 2022. – [Electronic resource] – Access mode: https://www.me.gov.ua/
14. IMF. Review of Economic Reforms in Ukraine. – International Monetary Fund, 2021. – [Electronic resource] – Access mode: https://www.imf.org/
15. State Statistics Service of Ukraine. Energy Sector of Ukraine in Wartime Conditions. – State Statistics Service of Ukraine, 2022. – [Electronic resource] – Access mode: http://www.ukrstat.gov.ua/
16. Ekonomichna Pravda. Innovations and Technological Development of Ukrainian Business. – Ekonomichna Pravda, 2022. – [Electronic resource] – Access mode: https://www.epravda.com.ua/
17. National Bank of Ukraine. Economic Review and Forecasts. – National Bank of Ukraine, 2022. – [Electronic resource] – Access mode: https://bank.gov.ua/
18. OECD. Global Competitiveness Report. – Organisation for Economic Co-operation and Development, 2021. – [Electronic resource] – Access mode: https://www.oecd.org/
19. World Bank. Doing Business in Ukraine. – World Bank, 2022. – [Electronic resource] – Access mode: https://www.worldbank.org/
20. European Commission. The Impact of Sanctions on the Ukrainian Economy. – European Commission, 2022. – [Electronic resource] – Access mode: https://ec.europa.eu/

21. IT Association of Ukraine. Review of the Ukrainian IT Market. – IT Association of Ukraine, 2022. – [Electronic resource] – Access mode: https://itukraine.org.ua/

22. National Bank of Ukraine. Financial Review. – National Bank of Ukraine, 2022. – [Electronic resource] – Access mode: https://bank.gov.ua/

23. PrivatBank. The Use of Neural Networks for Fraud Detection. – PrivatBank, 2022. – [Electronic resource] – Access mode: https://privatbank.ua/

24. SoftServe. Innovative Solutions Based on Neural Networks. – SoftServe, 2022. – [Electronic resource] – Access mode: https://www.softserveinc.com/

25. MHP. Optimization of Production Processes Using Neural Networks. – Myronivsky Hliboproduct, 2022. – [Electronic resource] – Access mode: https://mhp.com.ua/

Погорелова К.А., Погорелов Ю.С. Розвиток українських підприємств із використанням нейромереж

Стаття розкриває особливості використання нейромереж для розвитку українських підприємств. Розглянуто теоретичні основи нейромереж, їхню історію, типи та приклади застосування у різних галузях. Особливу увагу приділено аналізу факторів розвитку підприємства, таких як технологічні інновації, економічні умови, організаційні зміни, рівень конкуренції та ринкові умови. Показано, що технологічний прогрес є ключовим чинником розвитку підприємств у сучасному світі. Досліджено сучасний стан розвитку українських підприємств у контексті адаптації до нових економічних умов, зокрема під час війни. Війна в Україні значно впливає на економіку, включаючи бізнес-сектор. Внутрішні виклики включають політичну нестабільність, економічні реформи, брак кадрів через мобілізацію, відключення електроенергії та необхідність модернізації виробничих потужностей. Зовнішні фактори включають глобальну конкуренцію, вплив міжнародних ринків та економічні санкції. Попри складні умови, українські підприємства мають можливості для зростання завдяки впровадженню новітніх технологій, таких як нейромережі. Проаналізовано основні виклики та можливості сучасності для українського бізнесу, та запропоновано напрями використання нейромереж для розвитку підприємства в розрізі кожного фактору розвитку підприємства з урахуванням особливостей функціонування бізнесу в Україні. Наведено конкретні приклади успішного впровадження нейромереж у банківському секторі (ПриватБанк), ІТ-компаніях (SoftServe) та агропромисловому комплексі (МХП). Проведено аналіз переваг та недоліків використання нейромереж, таких як підвищення ефективності, точність прогнозування, персоналізація послуг, зниження ризиків, а також викликів, пов'язаних з високими витратами, складністю інтеграції, браком кваліфікованих кадрів та залежністю від якості даних. Розглянуто перспективи розвитку підприємств з використанням нейромереж: підвищення продуктивності, якості продукції та послуг, ефективне управління ресурсами, зниження ризиків, інноваційний розвиток, адаптація до ринкових змін та підтримка стійкості. Доведено, що використання нейромереж має значний потенціал для трансформації підприємств, роблячи їх ефективнішими, гнучкими та інноваційними.

Ключові слова: нейромережі, розвиток підприємств, технологічні інновації, автоматизація, економічні умови, конкурентоспроможність.

Погорелов Юрій Сергійович - д.е.н., професор кафедри обліку та оподаткування Східноукраїнський національний університет імені Володимира Даля
Погорелова Катерина Андріївна - к.е.н., доцент кафедри менеджменту, маркетингу та публічного адміністрування, Східноукраїнський національний університет імені Володимира Даля