

## Using neural networks to improve business process efficiency

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**Abstract:** In modern business, neural networks have become a key tool for enhancing efficiency and competitiveness. Their ability to analyze large volumes of data, identify hidden patterns, and automate complex processes opens up new opportunities for optimizing various aspects of company operations. Neural networks are used for demand forecasting, supply chain management, customer experience personalization, risk prevention, and cost reduction. With the advancement of technology, their applications will continue to expand, encompassing new industries and business tasks. This paper examines the key benefits and prospects of using neural networks, as well as their contribution to the digital transformation of business.

**Key words:** Neural networks, artificial intelligence (ai), business processes, data analysis, pattern recognition, big data processing, predictive analytics, recommendation systems, quality control, predictive maintenance, logistics, supply chain management, marketing, personalization, fraud detection, cybersecurity, cost reduction, strategic planning, self-learning systems, healthcare, energy, environmental protection.

The modern world is rapidly transforming through the implementation of new technologies. Among them, artificial intelligence (AI) and neural networks stand out. These tools have become an integral part of business processes, enabling companies to enhance efficiency, reduce costs, and improve the quality of decision-making. This article explores how neural networks are used to optimize various aspects of business and what advantages they offer.

A neural network is a mathematical model inspired by the principles of how the human brain works. It consists of numerous interconnected artificial neurons capable of analyzing large volumes of data, identifying patterns, and making decisions based on input information.

**Key Features of Neural Networks:**

- 1) Self-learning. Neural networks can adapt to changes, improving their results as data increases.
- 2) Big data processing. They are highly effective in analyzing datasets that are too large or complex for traditional methods.
- 3) Flexibility. Neural networks are applicable in a wide range of industries, from manufacturing to marketing.

**Examples of Neural Network Capabilities:**

- 1) Recommendation systems (e.g., Netflix, Amazon).
- 2) Predictive analytics in the financial sector.
- 3) Process automation, such as document handling or logistics management.

Neural networks have become a crucial tool for optimizing and automating business processes across various industries. Their ability to process large volumes of data, identify hidden patterns, and make decisions allows companies to improve productivity, reduce costs, and enhance customer service quality. Below are key areas where neural networks are actively applied and demonstrate their efficiency.

**Manufacturing and Quality Control**

In manufacturing processes, neural networks address a wide range of tasks, from demand forecasting to equipment monitoring.

- 1) Demand forecasting. Neural networks analyze historical data, seasonal fluctuations, and market trends to accurately estimate the required production volume for the near future. This helps

avoid overproduction and minimize storage costs.

2) Quality control. Computer vision technologies powered by neural networks can automatically detect defects on production lines. For instance, quality control systems in the automotive industry identify even the smallest deviations from standards.

3) Predictive maintenance. By analyzing data from equipment sensors, neural networks predict potential failures and enable preventive maintenance, reducing downtime and extending equipment life.

Example: Siemens uses neural networks to monitor industrial equipment, significantly reducing repair and maintenance costs.

#### Logistics and Supply Chain Management

In logistics, neural networks play a key role in optimizing supply chains, improving routing, and automating warehouse operations.

1) Route optimization. Systems that analyze data on weather, traffic, and road congestion help logistics companies choose the most efficient delivery routes.

2) Inventory management. Neural networks predict demand for various products, minimizing storage costs and preventing shortages.

3) Warehouse automation. Robots controlled by neural networks can sort, package, and move goods in warehouses, significantly speeding up processes.

Example: Amazon actively uses Kiva robots powered by neural network algorithms to automate warehouse operations.

#### Marketing and Personalization

In marketing, neural networks help companies better understand their customers and create personalized offers.

1) Content personalization. Recommendation systems based on neural networks analyze user preferences, purchase history, and interactions with the platform, enabling tailored solutions.

2) Market trend analysis. Neural networks study consumer behavior to forecast demand changes and develop effective marketing strategies.

3) Chatbots and voice assistants. Automating customer service through neural networks ensures 24/7 support, improving customer satisfaction.

Example: Netflix uses neural network algorithms to create personalized recommendations for movies and TV shows, increasing user engagement on the platform.

#### Financial Services

In the financial sector, neural networks are used for data analysis, risk management, and fraud prevention.

1) Credit risk assessment. Systems analyze credit history, solvency, and borrower behavior to minimize default risks.

2) Fraud detection. Neural networks identify anomalous transactions, preventing fraudulent activities.

3) Stock market trading. Neural network-based algorithms analyze vast amounts of financial data to assist in investment decisions.

Example: PayPal leverages neural networks to monitor transactions, quickly identifying suspicious activities and protecting users.

#### 5. Retail and Customer Experience

In retail, neural networks enhance customer experience, predict demand, and automate processes.

1) Assortment management. Neural networks analyze sales data and suggest which products to add or remove from the inventory.

2) Facial recognition. Stores use neural network-based systems to recognize loyal customers and offer personalized discounts.

Example: H&M uses neural networks to analyze customer preferences and optimize in-store inventory.

#### Human Resource Management

Neural networks are also employed in HR processes, improving human resource management.

1) Recruitment. Algorithms evaluate candidates' resumes, comparing their skills with job requirements.

2) Engagement management. Analyzing employee behavior helps identify factors that influence their motivation and productivity.

3) Employee training. Neural networks create personalized training programs based on employees' current knowledge and competencies.

The use of neural networks in business offers numerous advantages, making them a key tool for enhancing efficiency and competitiveness. These technologies can tackle tasks that traditional methods either cannot perform or handle less effectively. Let's explore the main benefits of applying neural networks in business.

#### Automation of Complex Processes

Neural networks can automate tasks that require complex data analysis or pattern recognition. This enables:

Reducing human involvement. Automating routine operations minimizes errors and frees employees to focus on more creative tasks.

Speeding up operations. Neural networks process data in real time, which is especially crucial in areas like financial analytics where timeliness is critical.

Ensuring round-the-clock operations. Unlike humans, algorithms work without breaks or holidays, increasing productivity.

Example: Chatbots powered by neural networks can automate customer service by instantly responding to inquiries without human involvement.

#### Big Data Processing

Modern business processes generate vast amounts of information, and traditional data processing tools often struggle to analyze it effectively. Neural networks excel in:

High computational power. They can analyze millions of records in seconds.

Identifying hidden patterns. Neural networks can uncover relationships between data points that are hard to detect using classical analysis methods.

Flexibility in processing. They handle both structured numerical data and unstructured information such as images, text, and audio files.

Example: Companies use neural networks to analyze purchasing behavior, enabling them to create personalized offers and predict customer behavior.

#### Accurate Predictions

One of the key benefits of neural networks is their ability to make accurate predictions based on historical data. This opens up opportunities for:

Demand forecasting. Companies can accurately plan production and procurement, avoiding shortages or overproduction.

Market trend analysis. Neural networks help predict market changes, allowing businesses to adapt swiftly to new conditions.

Predictive maintenance. Forecasting equipment failures or system breakdowns reduces repair costs and prevents downtime.

Example: Airlines use neural networks to predict weather conditions and optimize flight routes, helping to save on fuel costs.

#### Personalization of Services and Products

Neural networks enable companies to tailor their offerings to the individual preferences of each customer. This is achieved through:

Behavioral analysis. Neural networks study purchase history, platform interactions, and other customer data to provide exactly what they need.

Generating recommendations. Data analysis results in personalized recommendation lists, boosting conversion rates and customer satisfaction.

Dynamic pricing. Algorithms adjust prices for goods and services based on current demand, customer behavior, and other factors.

Example: Netflix and Spotify leverage neural networks to recommend content, helping retain audiences and enhance loyalty.

#### Anomaly Detection and Risk Mitigation

Neural networks excel at detecting anomalies in data, making them effective tools for risk management.

Fraud detection. Neural networks analyze transactions to identify suspicious activity, preventing fraud.

Cybersecurity. Neural-network-based systems detect unusual network behavior, enabling prompt responses to threats.

Quality control. In manufacturing, neural networks can identify even the smallest defects that might escape human observation.

Example: Financial companies like PayPal use neural networks to monitor transactions, preventing financial losses from fraudulent activities.

#### Cost Reduction

Implementing neural networks helps businesses optimize costs by:

Automating routine tasks. Reduced reliance on manual labor lowers payroll expenses.

Minimizing errors. The accuracy of neural networks reduces costs associated with fixing errors or defects.

Efficient resource allocation. Neural networks assist companies in better utilizing resources, including staff, equipment, and materials.

Example: In logistics, neural networks optimize delivery routing, significantly cutting transportation and fuel costs.

#### Improved Strategic Planning

Neural networks provide valuable insights that help companies make informed strategic decisions.

Financial forecasting. Algorithms analyze economic and internal company data to predict revenues and expenses.

Business process optimization. Neural networks identify bottlenecks and suggest ways to address them.

Enhancing competitiveness. Leveraging advanced technologies allows companies to stay ahead in the market.

With the development of technology, neural networks will increasingly integrate into business processes. Possible directions include:

Development of self-learning systems. These systems will be able to adapt to changes in real time.

Expansion of application areas. Neural networks can be used in new industries such as healthcare, energy, and environmental protection.

Simplification of technologies. New tools will make working with neural networks more accessible for small and medium-sized enterprises.

Neural networks are already playing a key role in enhancing business process efficiency, and their importance will continue to grow. Companies that are the first to master and implement these technologies will gain a significant competitive advantage. However, successful integration requires a thoughtful approach, consideration of all potential risks, and continuous process improvement.

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### Ерлер мен әйелдердің көшбасшылықтағы ерекшеліктер

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Түйіндеме. Ерлер мен әйелдердің көшбасшылықтағы айырмашылықтары заманауи ұйымдар мен қоғамдық басқару саласында өзекті мәселе болып табылады. Зерттеулер көрсеткендей, ерлер мен әйелдер басқару тәсілдерінде жиі әртүрлі әдістерді қолданады, бұл олардың көшбасшылық стильдері, шешім қабылдау үрдісі және ұжыммен қарым-қатынасында көрініс табады. Ерлер, әдетте, тапсырмаларға бағытталған директивті стильге бейім болса, әйелдер көбінесе ынтымақтастық пен эмоциялық интеллектке назар аударатын қолдау көрсету көшбасшылығын көрсетеді. Гендерлік стереотиптер де көшбасшылық қасиеттерді қабылдау мен бағалауға айтарлықтай әсер етеді. Маңызды аспект ретінде гендерлік әртүрліліктің басқарудың тиімділігі мен корпоративтік мәдениетке әсерін, сондай-ақ әйелдердің жетекшілік қызметке көтерілуінде кездесетін кедергілерді айтуға болады. Ерлер мен әйелдердің көшбасшылықтағы айырмашылықтарын талдау басқару механизмдерін тереңірек түсінуге және мемлекеттік басқаруда инклюзивті көшбасшылық үшін стратегиялар ұсынуға мүмкіндік береді.

Кілт сөздер: әйелдер көшбасшылығы, гендерлік стереотиптер, Қазақстан

Ерлер мен әйелдердің көшбасшылықтағы айырмашылықтары зерттеулер, тәжірибе және пікірталастардың өзекті тақырыбы болып қала береді. Гендерлік стереотиптер, мәдени нормалар мен әлеуметтік күтулер көшбасшылар қандай болуы керек деген түсініктерді ұзақ уақыт бойы қалыптастырғанымен, заманауи көшбасшылық тәсілдері инклюзивті бола бастады, ал басқару стильдерінің әртүрлілігін түсіну барған сайын артып келеді.