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Melnytskyi Ihor

Software developer

AI IN DATA ANALYSIS: HOW ARTIFICIAL INTELLIGENCE HELPS BUSINESSES MAKE DECISIONS BASED ON BIG DATA

***Summary.** In today's world, data volumes are growing exponentially, creating both huge opportunities and serious challenges for businesses. Artificial intelligence (AI) is becoming a key tool for big data analytics, allowing companies to extract valuable information, optimize processes, and make informed decisions. This article discusses the main AI methods and technologies used in data analysis, as well as their practical application in various business sectors. Particular attention is paid to the advantages and limitations of using AI, as well as the prospects for its development in the context of big data analysis. The article is intended to provide the reader with a deep understanding of how AI is transforming approaches to working with data and what opportunities it opens up for businesses.*

***Key words:** data, Artificial intelligence (AI), big data analysis.*

Introduction. With the development of digital technologies, the volume of data generated by businesses, consumers and devices has reached incredible proportions. According to experts, more than 2.5 quintillion bytes of data are created daily. This growth is due to the increase in the number of connected devices, active use of social networks, the development of the Internet of Things (IoT) and other digital technologies. However, data itself is of no value without its analysis and

interpretation. This is where artificial intelligence comes in, which is able to process, analyze and interpret large volumes of information with high speed and accuracy. Using AI in data analysis allows companies not only to automate routine processes, but also to identify hidden patterns, predict trends and make strategic decisions based on data. In this article, we will look at how AI helps businesses use big data to improve efficiency and competitiveness. We will also discuss the key technologies used in this area and provide examples of their use in various industries.

1. Key AI Technologies in Data Analysis

Artificial intelligence encompasses many technologies, each of which plays an important role in data analysis. These technologies not only handle structured data, but also work with unstructured information such as text, images, and audio. Below are the key methods and tools used in this field.

1.1 Machine Learning (ML)

Machine learning is one of the main AI technologies used for data analysis. ML allows computers to learn from historical data and make predictions or decisions without being explicitly programmed. The main approaches in ML include:

- **Supervised Learning:** This method is used for classification and regression problems, where the model is trained on labeled data. For example, an algorithm can be trained to predict the probability of a customer defaulting based on historical loan data.

- **Unsupervised Learning:** This approach is used to cluster and find hidden patterns in data. For example, companies can use clustering to segment customers based on their behavior.

- **Reinforcement Learning:** This method is used for problems where the model learns based on interactions with the environment. For example, reinforcement learning is used in robotics and autonomous systems development.

1.2. Deep Learning (DL)

Deep learning is a subset of machine learning that relies on neural networks. DL is particularly effective at processing unstructured data such as images, audio, and text. Convolutional neural networks (CNNs) and recurrent neural networks (RNNs) are examples of architectures widely used in DL. For example, CNNs are used for image analysis in medical diagnostics, while RNNs are used for text processing and time series forecasting.

1.3. Natural Language Processing (NLP)

NLP enables computers to understand, interpret, and generate human language. The technology is used to analyze text data such as customer reviews, social media posts, and documents. Modern models such as GPT and BERT are capable of generating text, answering questions, and even writing code.

1.4. Computer Vision

Computer vision analyzes visual data such as images and videos. This technology is used in retail, medicine, and manufacturing to automate processes and analyze visual information. For example, computer vision is used to automatically check product quality on production lines.

2. Using AI in Business Data Analysis

Artificial intelligence is used in various business sectors, helping companies optimize processes, improve customer service, and increase profitability. Let's look at a few examples.

2.1. Finance

In the finance sector, AI is used to analyze transactions, detect fraud, assess credit risks, and predict market trends. For example, machine learning algorithms can analyze historical data to predict changes in the stock market. Banks also use AI to automate credit scoring processes, allowing for faster and more accurate risk assessment.

2.2. Retail

In retail, AI helps analyze customer behavior, optimize product range, and personalize marketing campaigns. ML-based recommender systems offer customers products that they may be interested in based on their previous purchases and preferences. For example, Amazon actively uses recommender systems to increase sales.

2.3. Healthcare

In healthcare, AI is used to analyze medical data, diagnose diseases, and develop personalized treatments. For example, deep learning is used to analyze medical images such as X-rays and MRIs. AI also helps doctors make decisions based on the analysis of large volumes of patient data.

2.4. Logistics and Supply Chain Management

AI helps optimize delivery routes, forecast demand, and manage inventory. Machine learning algorithms analyze data on supply, demand, and external factors such as weather to minimize costs and improve efficiency. For example, companies such as DHL and UPS use AI to optimize logistics processes.
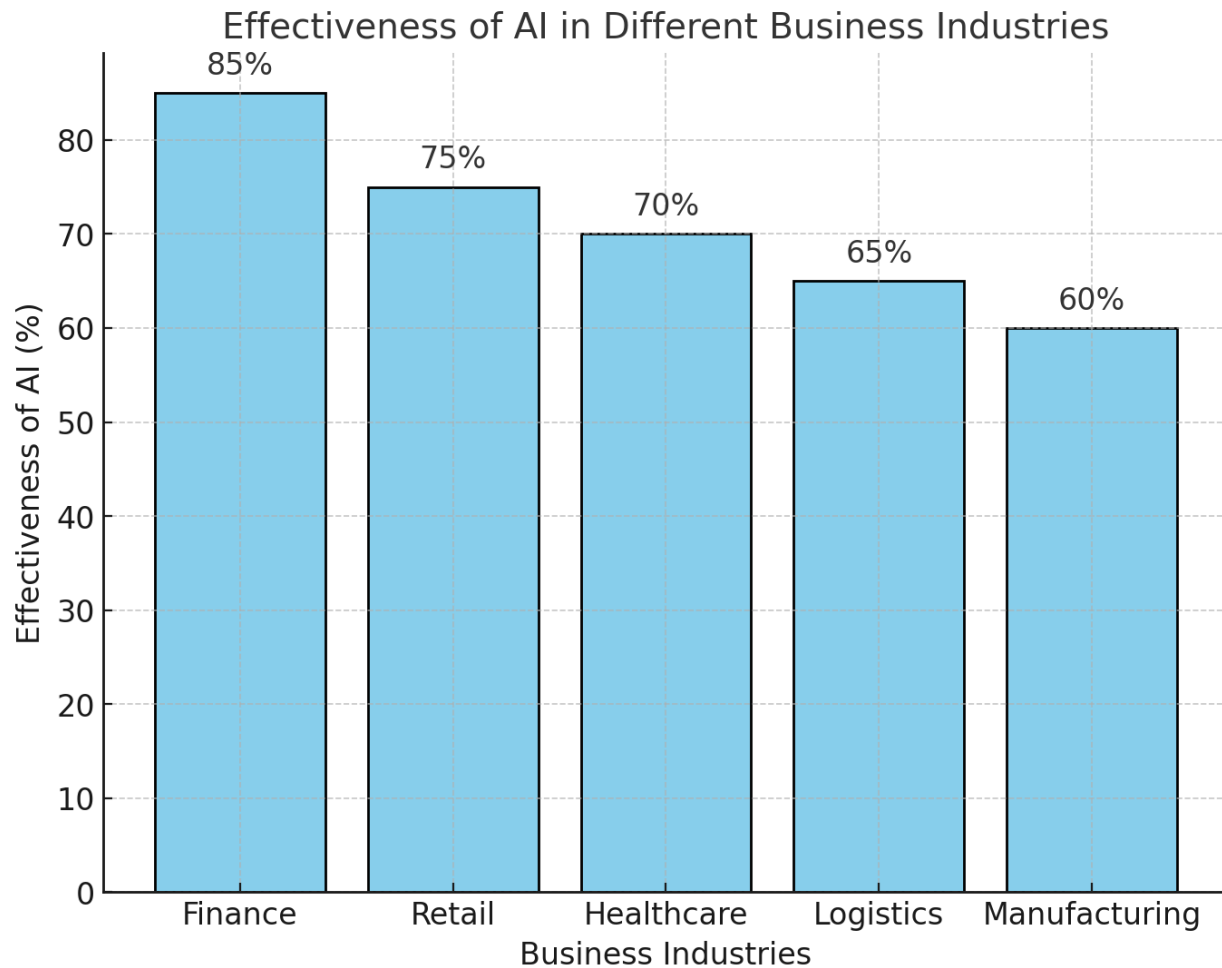
Fig. 1.

3. Benefits of Using AI in Data Analysis

Using AI in data analysis provides businesses with many benefits that make it an indispensable tool in the modern economy. Firstly, AI is able to process huge amounts of data in a matter of seconds, allowing companies to make decisions in real time. This is especially important in industries such as finance and logistics, where the speed of reaction to changes can determine the success of a business. For example, machine learning algorithms can analyze market data and predict price changes, helping traders make optimal decisions.

Secondly, AI ensures high accuracy of forecasts. Machine learning algorithms are able to identify complex patterns that are inaccessible to human analysis. This

allows companies to make more accurate demand forecasts, assess risks, and optimize processes. For example, in retail, AI helps predict demand for products, which helps minimize costs and avoid excess inventory.

Thirdly, AI helps automate routine tasks such as data collection and processing. This not only reduces costs but also frees up employees to perform more complex and creative tasks. For example, in healthcare, AI automates the analysis of medical images, allowing doctors to focus on treating patients. In addition, AI helps create personalized offers for customers, which increases their satisfaction and loyalty. For example, machine learning-based recommendation systems offer customers products that they may be interested in based on their previous purchases and preferences.

4. Limitations and Challenges

Despite many advantages, the use of AI in data analysis is associated with a number of limitations and challenges that must be taken into account. One of the main problems is data quality. The effectiveness of AI directly depends on the quality of the data on which it is trained. Inaccurate, incomplete or biased data can lead to erroneous conclusions and decisions. For example, if a model is trained on data that does not reflect the real situation, its predictions will be unreliable. Therefore, companies must pay special attention to collecting, cleaning and preparing data.

Another challenge is the ethical issues associated with the use of AI. The collection and analysis of personal data can violate the rights of users, which raises public concerns. For example, using AI to analyze customer behavior can be perceived as an invasion of their privacy. In addition, there is a risk of discrimination if AI algorithms make decisions based on biased data. Therefore, companies must develop ethical standards and ensure transparency in the use of AI.

The high cost of implementing AI is also a major limitation. Developing and implementing AI solutions requires significant investments in technology, infrastructure and personnel. This may be unaffordable for small and medium-sized businesses, creating an uneven playing field in the market. In addition, many companies face a shortage of qualified AI specialists, which makes it difficult to implement and use these technologies. Overcoming these challenges requires investment in education and training, as well as the development of accessible business solutions.
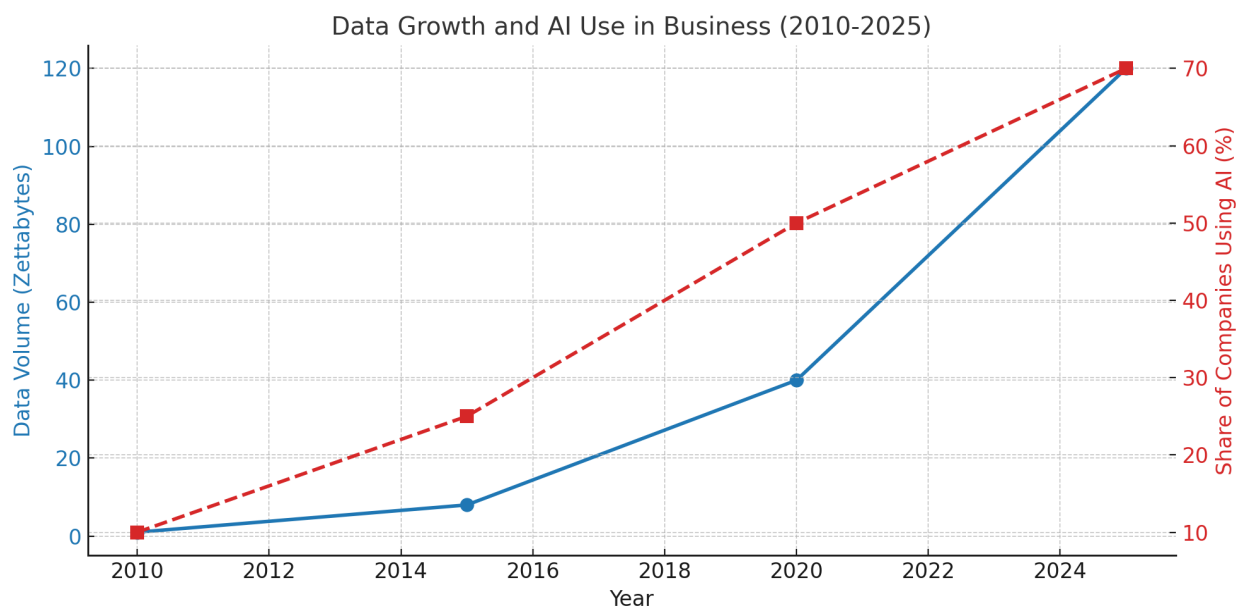

Fig. 2.

5. Prospects for the Development of AI in Data Analysis

The future of AI in data analysis is associated with the development of more complex and intelligent systems that will be able to solve even more complex problems. One of the key trends is the integration of AI with the Internet of Things (IoT). IoT generates huge amounts of data that can be effectively analyzed using AI. For example, in smart cities, AI can analyze data from sensors to optimize traffic

flows and reduce energy consumption. In industry, IoT and AI are used to predict equipment failures and optimize production processes.

Another important area is the development of autonomous systems, such as driverless cars and drones. These systems will increasingly rely on AI to analyze real-time data and make decisions. For example, driverless cars use AI to analyze data from cameras and sensors to safely navigate the roads. In the future, such systems may become the basis for new business models, such as autonomous delivery services and taxis.

An important aspect of AI development is improving the interpretability of models. Currently, many AI algorithms, especially deep learning, operate as "black boxes," making it difficult to understand their decisions. Developing methods to explain AI decisions will be an important area to increase trust in these technologies. For example, in medicine, doctors need to understand the data that AI used to make a diagnosis in order to make a final decision. Improving interpretability will also help companies comply with regulations and avoid errors.

Thus, the future of AI in data analytics promises to be bright and promising. These technologies will continue to transform businesses, opening up new opportunities for growth and innovation.

Conclusion. Artificial intelligence has become an integral part of modern business, providing powerful tools for analyzing big data. Its ability to process huge amounts of information with high speed and accuracy allows companies to identify hidden patterns, predict trends, and make informed decisions. This is especially important in the context of increasing competition and the need to quickly respond to market changes. AI not only automates routine tasks, but also opens up new opportunities for innovation, helping businesses stay at the forefront of technological progress.

However, the implementation of AI is associated with a number of challenges, such as the need to ensure data quality, address ethical issues, and overcome the high cost of implementation. Companies must consider these aspects in order to maximize the potential of AI. In addition, it is important to develop expertise in the field of artificial intelligence to avoid mistakes and increase trust in these technologies. Only with a competent approach will AI be able to reveal its full potential and become a reliable partner in decision-making.

In the future, the development of AI will be associated with the integration of new technologies such as the Internet of Things (IoT) and autonomous systems, as well as with improving the interpretability of models. These trends will allow businesses not only to increase efficiency, but also to create new products and services that will meet the needs of the modern market. Thus, artificial intelligence will continue to transform approaches to data analysis, opening up new horizons for growth and development for companies.

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