

USE OF MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE IN LOGISTICS

Every day, all areas of our lives face new challenges, and one of them is logistics, which is undergoing significant transformations under the influence of global economic and technological changes. Modern logistics includes not only traditional processes of transportation and storage of goods but also the latest approaches to planning, demand forecasting, supply chain management and operations optimisation. In the context of global digitalisation, processing large amounts of data and using innovative technologies to increase efficiency and reduce costs are increasingly important in these processes.

One of the most promising areas in the development of logistics processes is the integration of ML (machine learning) and AI (artificial intelligence), which allow for the creation of adaptive systems for automation, forecasting and decision-making. These technologies can significantly improve the accuracy of demand forecasts, optimise delivery routes, and minimise operating costs. They can analyse vast amounts of data in real time, considering numerous variables, and offer solutions that may be unattainable for traditional information processing methods [1].

One of the most fundamental tasks in logistics is planning. Big data analytics and ML can help you analyse shipping costs in-depth, considering shipping rates, distance, type of transport, transport maintenance costs, and weather conditions. This allows you to create cost forecasts and adjust your budget promptly [2].

Artificial intelligence can predict warehouse needs, for example, based on seasonal peaks in demand. It can also help reduce the cost of holding excess inventory or suggest optimal procurement strategies. The models can consider variables such as warehouse rental, inventory, and storage costs.

Another important aspect is the use of AI and ML in fleet management. Artificial intelligence makes it possible to predict delivery times in real-time with high accuracy, considering various factors such as traffic jams, stops, and weather conditions. Algorithms can estimate the current speed of vehicles by analysing data from sensors and GPS and adjusting the delivery schedule. This can reduce delays, provide more accurate route planning, and, as a result, increase customer satisfaction and operational efficiency [3].

Machine learning allows for predicting which vehicles will be most efficient for specific routes by considering various factors such as the vehicle's technical condition, fuel consumption rates, carrying capacity, age, and the routes' characteristics. Machine learning models can make informed decisions about the most suitable vehicle for each task by analysing historical data and patterns. This approach leads to better fleet management by optimising the use of each vehicle, ensuring that the right vehicle is assigned to the right task.

In addition, ML can play a crucial role in analysing customer satisfaction by processing and interpreting large volumes of data collected from various touchpoints. By gathering information from customer reviews, service waiting times, purchase history, and even customer support interactions, ML systems can identify patterns that reveal trends and underlying issues impacting satisfaction levels. These algorithms can detect subtle nuances in customer behaviour and sentiment that might be missed by traditional analysis methods, providing deeper insights into the factors that influence how customers perceive a business [5].

In conclusion, using these technologies allows not only the optimisation of traditional processes of transportation and storage of goods but also the significant improvement of planning, inventory management, demand forecasting, and route optimisation. Thanks to their ability to analyse large amounts of data in real time and consider various variables, AI and ML help reduce costs, shorten the time to complete operations, and increase customer satisfaction. Going forward, further integration of innovative technologies into logistics processes will be crucial to increasing the competitiveness and sustainability of businesses on a global scale.

References

1. Bilokon O. Artificial Intelligence in Shipping and Logistics. Thalesians Marine Ltd, 2024. 166 p.
2. Vandeput N. Data Science for Supply Chain Forecasting. De Gruyter, 2021. 85 p.
3. Gilbert M. Artificial Intelligence for Autonomous Networks. Taylor & Francis Group, 2022. 392 p.
4. Computation and Big Data for Transport: Digital Innovations in Surface and Air Transport Systems / P. Neittaanmäki et al. Springer, 2020. 264 p.
5. How data science helps brands hyper-personalize their customer experience URL: <https://www.ibm.com/think/topics/data-science-for-customer-experience>.