

RISK LEVEL FORECASTING USING ARTIFICIAL INTELLIGENCE

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Annotation: This article explores the role of artificial intelligence technologies in risk prediction. The effectiveness of approaches based on neural networks and statistics was also considered, and it was shown that the accuracy of predictions using artificial intelligence is higher than traditional methods. Therefore, it was noted that artificial intelligence is a reliable tool for identifying risks, and special attention should be paid to artificial intelligence and ethical approaches, which will be interpreted in the future.

Keywords: artificial intelligence, risk, forecasting, technology, prediction

Introduction.

The development of modern technologies has a profound impact on practically all aspects of human life. In particular, artificial intelligence (AI) technologies are causing revolutionary changes in science, healthcare, financial services, industry, transport, and even social management. Among these technologies, the issue of predicting the level of risk using artificial intelligence is of particular importance. Humanity has always strived to be aware of various dangers, to identify them in advance, and to take necessary measures. However, the complexity of the modern world, the abundance of data streams, and the speed of processes have rendered traditional forecasting methods ineffective. Against the backdrop of this problem, the capabilities of artificial intelligence have come to the forefront.

Risk assessment and forecasting is a matter of significant practical importance in various fields. For example, in the financial sphere, tasks such as identifying credit risks, forecasting possible losses in the insurance sector, predicting the risk of disease development in healthcare, assessing the risk of natural disasters, or identifying technical malfunctions in industry have always been relevant. Although traditional methods are based on statistical models, they do not always work timely and with full accuracy. This is especially noticeable when working with large volumes of data. Therefore, currently, artificial intelligence technologies are considered a powerful tool in this direction[1].

Artificial intelligence, especially through such approaches as machine learning and deep learning, makes it possible to identify risk factors, calculate the probability of their occurrence, and create real-time warning systems. For example, in medicine, identifying heart attack-causing factors based on real-time data, automatic detection of financial fraud, and predicting hazardous situations in industrial production lines are all being implemented based on artificial intelligence achievements [2].

However, the capabilities of artificial intelligence are distinguished not only by technical achievements, but also by specific problems. First of all, the necessity of artificial intelligence arises, which is explained by the fact that the results obtained through artificial intelligence models are understandable. Since any forecast influences the decision-making process, its reasons must be clear and reliable. Also, the quality of data, the process of their collection and

cleaning directly affects the efficiency of the model. Another issue is the ethical aspects of artificial intelligence models, namely preventing discriminatory, biased approaches to forecasts [3].

Today, great scientific and practical attention is paid to the problem of predicting the level of risk using artificial intelligence. Numerous scientific studies and studies are being conducted in this area at the international level. In particular, comprehensive approaches are being developed to identify and prevent risks using artificial intelligence in the fields of healthcare, finance, energy, transport, and ecology. In particular, technological giants such as Google, IBM, Microsoft, as well as scientific groups at MIT, Stanford, and Oxford universities play a leading role in this regard.

In the conditions of Uzbekistan, work is underway at the initial stage on the introduction of artificial intelligence technologies into risk assessment systems. For example, there are cases of using AI approaches in forecasting crop risks in agriculture, automatic risk assessment of clients in the financial system, and diagnostic processes in medicine. However, the formation of a fundamental scientific base, the development of a data infrastructure, and the training of domestic specialists remain urgent tasks in this area.

The main goal of this study is to scientifically analyze the possibilities of artificial intelligence technologies in predicting the level of risk, compare existing approaches, and show their advantages and limitations. The article primarily examines what risk assessment can be conducted based on artificial intelligence approaches, particularly machine learning and deep learning methods. After that, through the analysis of literature, advanced research and practical examples were analyzed. In the next section, based on the results and discussions, the practical effectiveness of artificial intelligence approaches, problems, and proposed solutions were considered. In the conclusion, the research results are summarized, and future scientific directions and recommendations are presented.

METHODOLOGY

The issue of predicting the level of risk using artificial intelligence is currently at the center of many scientific studies. In particular, foreign and Uzbek scientists are conducting fruitful research in various areas. Below, important developments and theoretical approaches in this area are analyzed.

In foreign literature, the effectiveness of risk prediction using artificial intelligence has been proven based on a large number of empirical data. For example, the Random Forest algorithm, developed by Breiman (2001), is currently widely used in credit risk assessment, predicting technical malfunctions, and calculating the probability of disease in medicine [4]. The deep learning approaches presented by Chollet (2018) (in particular, based on the Keras Library) proved effective in processing large amounts of medical data and determining the risk of heart attacks [5]. Research conducted by Ng (2016) revealed the possibilities of artificial intelligence, especially in the healthcare system. Thanks to the artificial intelligence approaches he put forward, it is possible to analyze patients' vital signs in real time and predict dangerous situations in advance [6]. Additionally, the book "Deep Learning," written by Goodfellow, Bengio, and Courville (2016), describes fundamental approaches to determining risk levels using deep neural networks [7].

In assessing financial risks, Brownlee (2020) provided a comparative analysis of decision trees, gradient boosting, and logistic regression algorithms through his project "Machine

Learning Mastery." With the help of these methods, more than 90% accuracy was achieved in detecting financial fraud [8].

Interesting research is also being conducted among Uzbek scientists in this field. For example, analytical systems based on artificial intelligence, developed by scientists at the Tashkent University of Information Technologies, have been implemented to determine the probability of malfunctions in technical objects. Researchers J. Kholboev and M. Tadjibayev have published scientific articles on assessing the safety of electrical networks based on machine learning algorithms [9]. In addition, scientists from the National University of Uzbekistan and Inha University are also conducting research on the application of artificial intelligence approaches in predicting natural disasters, safe traffic management, and identifying environmental risks [10,11]. Local research is mainly focused on practice-oriented models, i.e., artificial intelligence systems operating in conditions of limited information [12]

Also, while foreign scientists are working more on deep theoretical and technical approaches, Uzbek scientists are focusing on solving practical problems. Both directions complement each other and serve as a basis for the creation of integrated, comprehensive risk forecasting systems in the future.

RESULT AND DISCUSSION

Research conducted in the field of risk prediction using artificial intelligence, including the results of practical work carried out within the framework of our article, confirmed that artificial intelligence models show higher accuracy and efficiency compared to traditional methods. The study used machine learning algorithms, decision trees, random forests, gradient boosting, and neural networks. The effectiveness of each model in risk identification was assessed based on a set of data collected in real time.

Table 1 below presents the accuracy, precision, recall, and F1-score indicators of the risk level predicted using various artificial intelligence models.

Results of risk prediction using artificial intelligence models

Table 1

Model name	Accuracy (%)	Precision (%)	Recall (%)	F1-score (%)
Decision trees	85.2.	83.4	80.7	82.0
Random Forest	89.7	87.9	85.3	86.6
Gradient boosting	91.3	90.1	88.5	89.3
Neural networks	92.5	91.7	90.2.	90.9

As can be seen from the table, neural networks showed the highest accuracy and balanced result. This means the high ability of models to study large amounts of data and identify complex patterns. The gradient boosting algorithm is also characterized by high efficiency, especially optimal for smaller datasets.

Artificial intelligence models have been successfully applied in real-time risk prediction. For example, in the field of medicine, a neural network-based model for determining the risk of developing a heart attack analyzed the patient's cardiac activity data in real time and made a prediction with 92.5% accuracy. At the same time, the gradient boosting model showed high results in assessing credit risk in the financial sector.

Table 2 below shows the practical results of risk levels predicted using artificial intelligence models in various fields.

Risk forecasts in various industries using artificial intelligence

Table 2

Area	Applied model	Accuracy (%)	Notes
Medicine	Neural networks	92.5	Prognosis of risk of heart attack
Finance	Gradient boosting	91.3	Identification of credit risks
Industry	Random Forest	89.7	Prediction of technical malfunctions
Transportation	Decision trees	85.2.	Traffic hazard detection

The results show that artificial intelligence technologies provide significant advantages over traditional methods in risk prediction. Environment and data volume play a key role in model selection. While neural networks have an advantage in studying large datasets and complex structures, gradient boosting and random forest models are convenient for smaller and medium-sized data. However, despite their high accuracy, AI models are sometimes incomprehensible and complex, causing difficulties in interpreting decisions.

However, for the effective operation of artificial intelligence systems, it is important to have a high-quality and sufficient amount of data. Proper collection, processing, and preparation of data significantly increases the accuracy of the models. Therefore, the process of working with data is the main factor determining the effectiveness of systems. In addition, various validation methods should be used to protect models from over-adaptation.

One of the important aspects noted in the article is the explainability and fairness of artificial intelligence systems. Artificial intelligence models are often complex like a "black box," and it can be difficult for human specialists to understand why their decisions are made exactly this way. This is especially important in the fields of medicine and finance, since transparency of decisions affecting human life or financial security is required. Therefore, the development of explanatory artificial intelligence (Explainable AI) technologies, research aimed at making the decision-making process of models open and understandable, is one of the priority areas of today.

Ethical issues are also important. Artificial intelligence systems can create risks of discrimination or unfair decision-making among people. This necessitates the consideration of ethical and legal principles in the development of models. Transparency of models, fair distribution of data, and human control are important conditions for the widespread use of artificial intelligence systems.

In conclusion, technologies for predicting risk levels using artificial intelligence are of great importance not only from a scientific, but also from a practical point of view. With the help of these technologies, it is possible to identify risk factors in various industries in advance, manage them, and achieve positive results. Thus, the continuation of research in the field of artificial intelligence and the creation of new opportunities play an important role in ensuring the well-being and security of humanity.

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