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THE ROLE AND FUTURE PROSPECTS OF ARTIFICIAL INTELLIGENCE IN DEVELOPING CREDIT SCORING MODELS

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Abstract: In recent years, artificial intelligence (AI) and machine learning (ML) technologies have been revolutionizing one of the most important areas of the financial system - credit scoring. Credit scoring is crucial for banks and financial institutions in assessing the financial worthiness of borrowers and minimizing risks. While traditional statistical methods (e.g., logistic regression, FICO score) are effective to some extent, they cannot fully capture the complex, nonlinear patterns of the modern digital economy, as well as the wide range of alternative data sources. This article provides an in-depth analysis of modern AI algorithms used in credit scoring, their strategic advantages over traditional methods and practical challenges. The article also highlights the technological trends expected in the future (explainable AI, blockchain) to make this industry more transparent, secure, and inclusive, and the specific aspects of introducing AI in the Uzbek financial market.

Keywords: credit scoring, artificial intelligence, machine learning, financial technology (FinTech), risk assessment, blockchain, data security, financial inclusion.

Introduction. The main condition for the stability and development of the financial system is the correct management of credit risks. When allocating loans to clients, banks, microfinance institutions and other lending institutions are obliged to accurately assess their ability to repay the loan in a timely and full manner. An incorrect assessment leads not only to financial losses for the lender and deterioration of the loan portfolio, but also to excessive debt burden and increased financial difficulties for the borrower, which can have a negative impact on the entire national economy.

Traditional credit scoring models usually rely on a limited set of indicators, such as the borrower's age, place of employment and tenure, monthly income, previous debt history and repayment habits. Although these methods are simple, understandable and tested in practice, their potential is limited in the dynamic conditions of the modern digital economy. For example, in Uzbekistan, while a large portion of the population uses bank cards and mobile applications, a significant portion of the population, especially young people and small entrepreneurs, still lacks a formal (bank) credit history. This problem of "credit blindness" keeps them out of financial services.

Artificial intelligence technologies play a crucial role in solving this problem and taking credit assessment to a new level. Modern AI algorithms analyze not only traditional data, but also alternative (alternative) data, such as mobile payment history, utility bill history, online shopping cart, geolocation data, and even (subject to privacy rules) activity on social networks, creating a clearer picture of a person's financial etiquette and stability. This will allow millions

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of people without a formal credit history, including citizens of Uzbekistan, to access financial services (for example, microloans, prospective payment terms).

Artificial intelligence is a separate field of computer science that deals with the creation of computer systems with capabilities typically associated with human intelligence: language understanding, teaching, discussion, problem solving, translation, etc. Artificial intelligence (AI) allows computers to learn from their own experience, adapt to given parameters, and perform tasks that were previously only possible for humans. In many cases of AI implementation - from computer chess players to unmanned vehicles - the ability to process deep learning and natural language processing is crucial. Thanks to these technologies, computers can be "taught" to perform specific tasks by processing large amounts of data and re-analyzing the information in them. A striking example of this is the ChatGPT generative AI chatbot, which debuted by OpenAI in November 2022. ChatGPT, which is widely used in the financial sector and other industries, has reached more than 100 million users in two months and has become the fastest growing application in the history of the Internet [1-Internet materials].

Literature analysis. Artificial intelligence is one of the most advanced modern technologies that can be applied in almost any field of activity. Due to its ability to promote consumer innovation, this technology allows users to make faster and more effective decisions. However, the use of artificial intelligence in the banking sector has not been widely recognized and has slowed down until the emergence of Internet banking. Recently, the banking sector has been actively developing as an adapter of artificial intelligence by researching and implementing this technology in new ways[2]. In the process of understanding the prospects for the development of artificial intelligence, many programmers and advanced managers of enterprise digitization come to the conclusion that the problems of artificial intelligence in scientific understanding are related to the recognition of artificial intelligence systems and ordinary human thinking. In scientific research, questions about whether attempts to embody the epistemological properties of thinking in modern artificial intelligence systems have not only been made, but have been successful, and whether there are grounds for arguing about the possibility of establishing the fact of the full transfer of intellectual functions to technical systems and providing them with epistemological tools are becoming increasingly relevant [3 p-373-389].

Since data and technology have traditionally been the benchmarks of banking, it is clear that drivers and concepts such as artificial intelligence in banking will change the game. Of course, expanding the scope of automation aimed at significantly simplifying banking procedures and processes, technology can indeed make the process more efficient and effective at the same time. An automated process has the characteristics of stable performance compared to manual work. Banks must guarantee the confidentiality of customer data, the security of information and cash flows, and artificial intelligence can play a role here[4]. In addition, several decisions have been made on the introduction of artificial intelligence technologies in the banking system. We can cite the Resolution of the President of the Republic of Uzbekistan “On measures to create conditions for the accelerated introduction of artificial intelligence technologies” dated February 17, 2021. This resolution fully reflects the areas in which artificial intelligence technologies will be used, as well as the tasks envisaged in this regard[5].

Discussion and analysis. Logistic regression is a major statistical model that has been used in credit scoring for decades. Its main advantages are simplicity, robustness, and easy

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interpretation of results. However, its main disadvantage is that it can only detect linear relationships and ignores the complex, nonlinear relationships inherent in the financial world.

Decision Trees are a model that classifies data by sequential division based on certain logical conditions. For example: “If a client is over 30 years old, has an income of more than 5 million soums, and has not been late on previous loans, then he is considered ‘reliable’.” The advantage is that the decision-making process is visual and understandable. The disadvantage is sensitivity to small changes (extreme flexibility) and the dependence of the final result on a single tree.

Random Forest is an ensemble method that uses the “collective intelligence” of several (hundreds or thousands) decision trees. Each tree is based on a randomly selected portion of the data. The final score is based on the votes of all the trees. This method significantly increases accuracy, provides stability, and alleviates the problem of overfitting.

Gradient boosting (XGBoost, LightGBM, CatBoost) is one of the most powerful ensemble methods that currently shows the highest results in international credit scoring competitions (e.g. Kaggle) and is widely used in practice. It learns from the errors of successively created weak models (usually shallow decision trees) by correcting the shortcomings of each previous model. As a result, a powerful model is created with very high accuracy and the ability to recognize complex patterns.

The Chinese company Ant Financial (owner of the Alipay application) uses deep learning in its “Zhima Credit” (Sesame Credit) system. The system analyzes users’ payment habits, online purchases, even their friends list, and hundreds of other parameters to determine a credit score, which allows not only to get a loan, but also to rent a hotel room or a car.

Research and practical results show that properly calibrated AI models (especially Gradient Boosting and Random Forest) are 15-30% more accurate than traditional logistic regression in predicting loan defaults, allowing banks to avoid potential losses of billions of soums.

AI-based systems can review and make a decision on a loan application in a matter of seconds, without any human intervention. This speeds up the process, reduces the workload of employees, and reduces the likelihood of human error to almost zero. This feature is especially important during seasonal sales (for example, before the New Year) or during big discounts, when the flow of applications increases sharply.

This is one of the most important social benefits of AI. Startups such as CRED or Indifi in India analyze the history of the population in paying for mobile operators and utilities, and offer individual conditions for first-time customers. The same approach can open credit doors in Uzbekistan for young people and small business owners who make “honest” payments but do not have a bank credit history.

Automation of loan application processing allows banks to hire fewer loan specialists or focus their workload on other high-value-added tasks (for example, working with complex clients, financial advice). This improves the bank’s overall cost structure and ultimately translates to a lower loan price for the customer.

It is difficult to explain how sophisticated AI models, especially neural networks, arrive at a particular score or rejection decision. When a customer asks, “Why was my application rejected?” simply saying, “Your model thinks so,” is not satisfactory. This can lead to a loss of customer trust for the bank. To address this problem, the field of Explainable Artificial Intelligence (Explainable AI – XAI) is emerging, which attempts to explain each decision of the model based on specific factors and weighting factors.

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If an AI model is trained on historical data, it can also pick up on historical biases. For example, if the database contains inaccurate stereotypes about people from a particular region, marital status, age, or occupation, the model may give them unfair ratings. There is evidence in the US that people from certain racial minority groups are more likely to have their credit applications rejected by AI. To prevent bias, it is necessary to carefully clean the data and use tools to check the algorithms for bias.

AI systems collect and process vast amounts of people's personal data. This makes them attractive targets for cyberattacks and data breaches. The General Data Protection Regulation (GDPR) in the European Union and the Law on Personal Data adopted in Uzbekistan in 2019 aim to mitigate such risks. Banks are required to adhere to high standards such as data encryption, anonymization, and strict permission-based processing. In addition, the digital core of the banking sector has been a constant challenge in the digital age, but generative AI offers new hope. In just a few months, tools such as AWS CodeWhisperer, GoogleCloud's Duet AI, and Microsoft's GitHub Copilot have demonstrated the ability to decode COBOL code. These technologies will significantly reduce the time required to complete modernization projects. According to Accenture Technology Vision 2024, 95% of bank executives believe that generative AI will lead to the need to modernize their organizations' technology architecture. The funds that financial and other companies are spending on the development of artificial intelligence are setting new priorities. According to the international research and consulting company International Data Corp, sales of software, equipment and services for artificial intelligence systems will grow by 29% this year to $166 billion and reach $400 billion in 2027. The financial sector's spending will more than double to $97 billion in 2027. Among the five major sectors, the annual compound growth rate is expected to reach the fastest - up to 29% [6-Internet materials].

Results. This is a new approach that promises to solve a number of problems, especially data privacy. In federated learning, no personal information is sent to a central server. Instead, an AI model (for example, on a bank server) is sent to customers' personal devices (smartphones). The model is trained locally with the customer's data, and only the changed parameters (weights) are sent back to the central server encrypted. The server integrates updates from all customers and improves the model. This method ensures that the data remains in place and dramatically increases the level of privacy. Blockchain offers a new approach to credit scoring by creating an immutable and transparent archive. Each credit transaction, payment, and contract can be recorded on the chain as a specially encrypted block. This not only increases data security, but also allows the customer to securely and quickly share their credit history with different banks and even financial institutions in other countries. This returns "ownership of the data" to the customer. A number of projects in this area are underway in Singapore and Switzerland.

Future AI systems will be able to not only make decisions, but also to clearly, understandably and legally defend these decisions. A bank employee can show a customer a detailed report on the screen: "Your application is rated 25% risky due to the following reasons: 1) your income has been highly volatile in the last 3 months, 2) you have been late on utility payments 2 times, 3) your credit history is very short."

The Concept for the Development of Financial Technologies, published by the Central Bank of Uzbekistan in 2023, lists the use of artificial intelligence in financial services, including credit risk assessment, as one of the priority areas. Uzbek banks have already begun to implement AI-based applications. The main focus should be on developing models that take

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into account the specific characteristics of the local market (for example, a large number of family households, a strong desire for real estate, RPDT - that is, the difference between the officially declared income by the employer and the actual income). In addition, it is important to further improve the data exchange platform (credit bureau) at the national level and integrate it with AI systems.

Conclusion. Artificial intelligence is fundamentally reshaping credit scoring systems, freeing them from traditional boundaries and making them more accurate, faster, inclusive and affordable. It not only increases the efficiency of banks' risk management, but also creates access to credit for segments of the population that were previously excluded from financial services.

However, these opportunities are not without a number of serious challenges and issues that require a responsible approach. The problem of the "black box", the risk of algorithmic injustice and the protection of personal data remain pressing issues.

In the future, technologies such as federated learning, blockchain and interpretive AI will help form a more reliable, transparent and secure credit ecosystem. An important task for Uzbekistan is to study these global trends, adapt them to the realities of the local economy, develop the legal framework and train highly qualified specialists - data scientists, SI engineers and FinTech specialists - who will be able to develop the industry. Only with this approach will it be possible to fully realize the positive potential of artificial intelligence credit scoring and contribute to sustainable economic growth.

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