UDK 004

DEVELOPMENT OF AN INTELLIGENT RISK MANAGEMENT SYSTEM IN BANK LENDING

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Introduction. The provision of loans occupies a central place in the activities of Kazakhstani banks and has a significant impact on the development of the country's economy. With the growing demand for banking services from small and medium-sized businesses as well as individual clients, domestic banks face the need to improve the quality of credit risk management. The issue of loan defaults remains relevant, reducing the financial stability of banks and ultimately affecting the stability of the entire national economy [1].

Existing methods of credit risk analysis often require significant labor and time resources. In the context of Kazakhstan's dynamically changing economy, this leads to slower decision-making processes, reduced operational efficiency, and an increase in the share of non-performing loans. Therefore, the implementation of automated methods for assessing credit risks is viewed by banks as a key condition for strengthening their stability and competitive position.

The use of an automated credit risk analysis system enables banks to process large volumes of data and apply modern analytical tools for fast and accurate assessment of clients' creditworthiness. Such systems take into account numerous factors affecting the probability of loan repayment, thereby minimizing errors and promoting more rational management of the credit portfolio.

In situations where commercial banks face growing overdue debts, inefficient credit policies, or the impact of economic and political factors, it becomes necessary to improve methods for assessing borrowers' creditworthiness. This not only reduces credit risks but also enhances the profitability of banking services. An important element is determining the level of threat posed by various types of risks and timely adjusting internal procedures to minimize them.

The relevance of this study lies in the development of an automated credit risk analysis system that enables timely and accurate assessment of the probability of loan defaults and minimizes the losses of commercial banks [2–4].

Main Part. Within the framework of the project, several machine-learning models were tested:

- Logistic Regression — logistic regression;
- Random Forest — random forest;
- Decision Tree — decision tree;
- LightGBM;
- KNN — K-nearest neighbors method;
- CatBoost;
- XGBoost.

Analysis results:

– The best performance was achieved by the XGBoost model with an accuracy of 0.9734.

– The lowest accuracy was shown by logistic regression (0.9464), although the difference between models is minor.

– Gradient boosting methods (CatBoost, XGBoost, LightGBM) demonstrate better results compared to traditional machine learning algorithms.

– Simpler approaches (logistic regression, decision tree) are inferior to ensemble methods (Random Forest, XGBoost).

Since high accuracy is a key factor for the task at hand, the XGBoost model was chosen as the optimal solution [5].

The Python programming language was used to develop the intelligent system.

In the Automatic Credit system window, the following buttons are available: Home Page, Check, Map, and History.

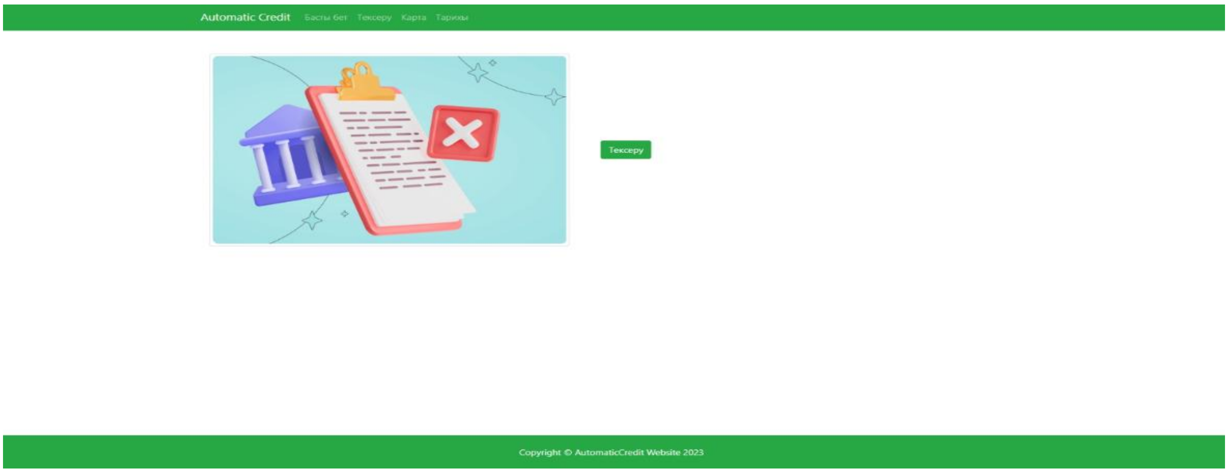

Figure 1 – Main page of the automatic credit system window

When navigating to the "Check" section, the client’s personal data are entered by filling in the following fields required for credit risk prediction.

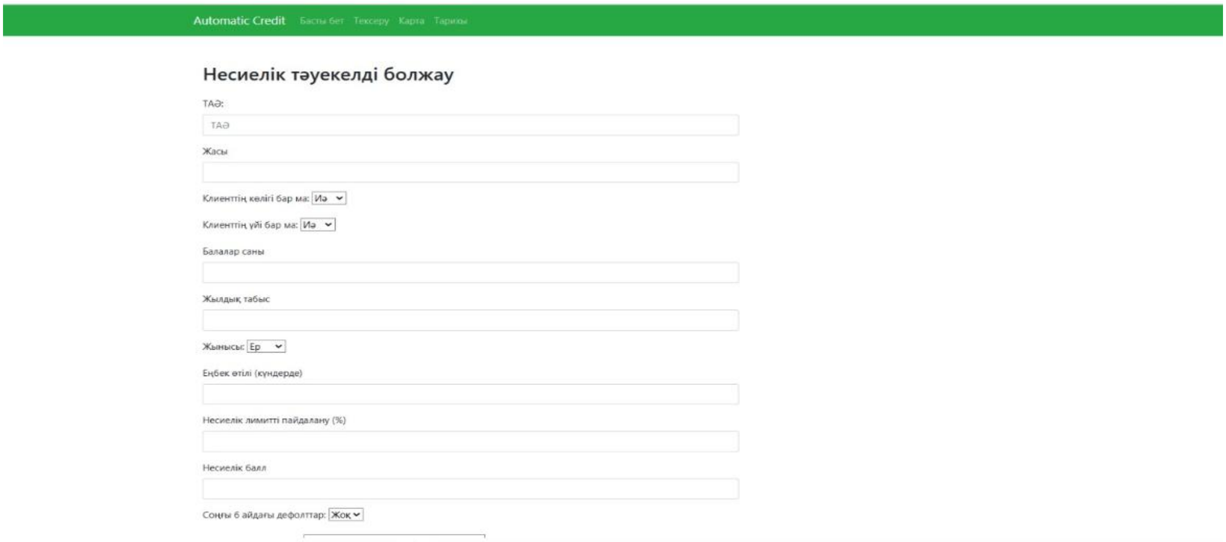

Figure 2 – Input fields for credit risk prediction

After completing all the forms, to view the result, it is necessary to click the “Forecast” button.

In response, the system provides a decision on granting the loan to the client: Approved: Yes or Approved: No.

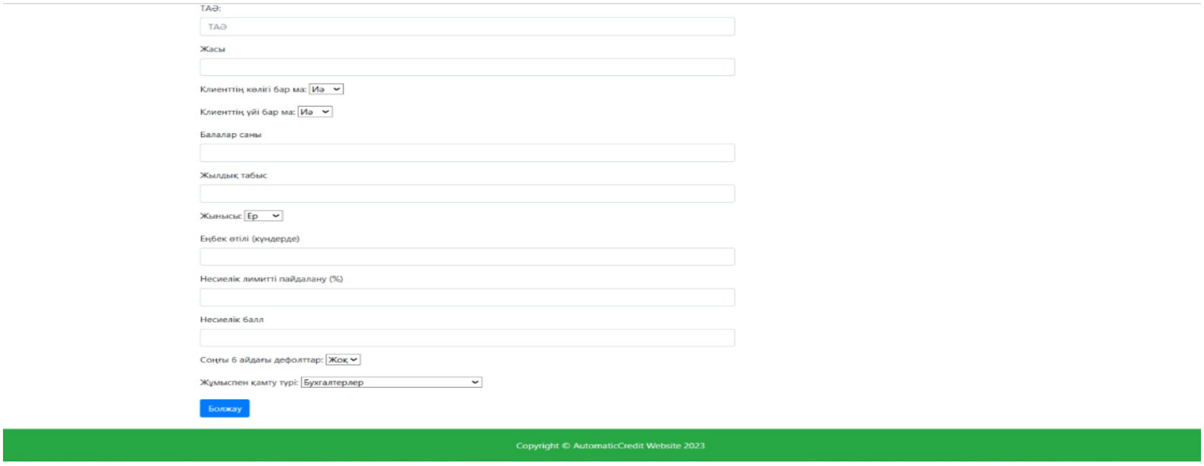

Figure 3 – Forms to be filled in

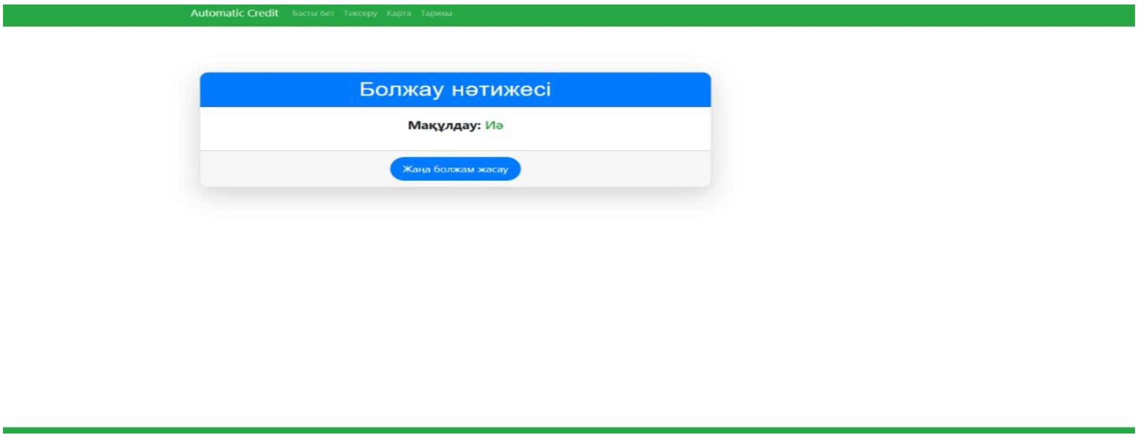

Figure 4 – Response Window: Approved — Yes

Using the "Map" button, one can view the location of the branch. The "History" button displays, in tabular form, all client data previously entered for credit risk prediction.

Automatic Credit Басты бет Тексеру Карта Тарихы

ID	ФИО	Жасы	Автомобиль	Үй	Бала саны	Жылдық кіріс	Кәсіп түрі	Мақұлдау
1	0	98	Y		1	10000	occupation_Accountants	False
2	0	98	Y		1	10000	occupation_Accountants	False
3	0	29	Y		0	1000000000	occupation_Sales staff	False
4	0	29	Y		0	1000000000	occupation_Sales staff	False
5	Алексей Владимир	18	Y		0	1254990	occupation_Accountants	False
6	Sakam Licufer	30	Y		0	0	occupation_Accountants	True
7	Карлыгаш Есентай	21	Y		1	-11	occupation_Accountants	False
8	1	12	N		12	31	occupation_Accountants	False
9	1	22	N		1	20000	occupation_Accountants	False
10	1	22	Y		0	2000000	occupation_Accountants	False
11	1	0	Y		0	0	occupation_Accountants	True
12	1	22	Y		1	20	occupation_Accountants	False
13	1	22	Y		2	12	occupation_Accountants	False
14	0	12	Y		1	2540000	occupation_Accountants	False
15	Жаксылык Азамат	12	Y		12	25	occupation_Drivers	True

Figure 5 – Data displayed in the "History" window

Conclusion. Based on the conducted analysis, this study examined the process of credit risk management in lending to legal entities, the structure of the credit portfolio, and the methods for assessing credit risk. An intelligent risk management system for bank lending was developed.

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