West Science Business and Management
Vol. 3, No. 03, September 2025, pp. 566~573

The Application of Naïve Bayes Classifier in Digital Strategy for Optiminization of Credit Guarantee Deccisions in Conditional Automatic Cover (CAC) Scheme

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Article Info

Article history:

Received July, 2025
Revised September, 2025
Accepted September, 2025

Keywords:

Credit Guarantee
Digital Strategy
Naïve Bayes

ABSTRACT

As a non-bank financial institution, a guarantee company provides credit guarantees to individuals, government institutions, and/or business entities that are feasible in terms of business and business but do not yet meet banking requirements and are not creditworthy (feasible but not yet bankable). This guarantee activity involves three parties, namely the Guarantee Recipient, the Guaranteed, and the Guarantor. Credit assessment in this guarantee company is important to help MSMEs in obtaining financing from banks even though they are not yet bankable. This study aims to determine, measure accuracy and determine what factors influence the application of the Naïve Bayes Classifier in a digital strategy to classify which debtor criteria are eligible and unfit for Credit Guarantee. The categorization of the guarantee data variables used are work area, business sector, credit period, credit allocation, guaranteed age, and credit ceiling value. To achieve the objectives of this study, a digital strategy system is needed that utilizes machine learning to be able to classify guarantee data to determine which debtor criteria are eligible and unfit for Credit Guarantee. The Naïve Bayes Classifier method was chosen because of its simple and fast nature in classifying data but is effective in making predictions based on probability.

This study focuses on Micro products at one of the Recipients which is a Bank with the largest guarantee volume in the production of Micro Credit of XYZ Guarantee Company for the period 2022 to 2024. However, the large amount of guaranteed volume is followed by the large claim value, it is known that the increase in the Value of Micro Credit Claims at Guarantee Recipient A has increased significantly from the 4th quarter of 2023 and continues to increase until the 4th quarter. Micro Credit has a Conditional Automatic Coverage Scheme or commonly known as Conditional Automatic Coverage (CAC) which is a guarantee system that is carried out automatically and conditionally. The Naïve Bayes model showed an accuracy rate of 79.69%, indicating good performance and is feasible to be implemented in a data-based digital guarantee system. Variables such as credit value, credit term, business sector, debtor age, allocation, and work area are proven to contribute to the classification of claim risks. The results of this study can be used as a basis for guarantee companies in providing credit guarantees to prospective guarantees

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1. INTRODUCTION

The XYZ Guarantee Company was established in 1970 and is the largest guarantee company in Indonesia. Guarantee companies play a vital role in improving access to financing for SMEs to obtain business capital from banks. According to the official website of the Financial Services Authority (OJK), as of October 2024, there are 23 Guarantee Companies consisting of 1 State-Owned Enterprise, 17 Regional Companies (Jamkrida), 2 Private Companies, and 3 Sharia Companies. The credit guarantee products offered by XYZ Guarantee Company are as follows. As a non-bank financial institution, the guarantee company provides credit guarantees to individuals and/or business entities that are viable from a business perspective but have not met banking requirements and are not eligible for credit (feasible but not yet bankable). This guarantee activity involves three parties: the Guarantee Recipient, the Guaranteed Party, and the Guarantor. Through the involvement of these three parties, the guarantee company plays a role in facilitating MSME access to guarantee recipients by providing guarantees for most of the loans held by the guaranteed party.

The digital strategy at PT Penjaminan XYZ plays a crucial role and is a key pillar in the company's business transformation. As the largest guarantee company in Indonesia, PT Penjaminan XYZ has adopted a comprehensive digital approach to improve operational efficiency, expand its service reach, and strengthen its role in supporting MSMEs in the digital economy

As the largest credit guarantee company, PT Penjaminan Kredit XYZ faces the challenges and opportunities of the digital era. XYZ has taken several steps to digitize its operations and services, such as implementing a digital claims platform to simplify information and expedite the claims process for micro, small, and medium enterprises (MSMEs). XYZ has also optimized its non-assignment business and developed a more efficient business model through the integration of Application Programming Interfaces (APIs) to accelerate the guarantee process and data communication with banks/financial institutions.

To ensure the professional implementation of business activities, XYZ Guarantee Company has established its vision to be the primary choice for business actors in guarantee services to support the growth and equity of the national economy. Meanwhile, XYZ Guarantee Company's mission is to increase financial accessibility for MSMEs and Cooperatives (MSMEs) by providing innovative, competitive guarantees with professional, effective, and efficient services on an ongoing basis.

Credit assessments for these guarantee companies are crucial for assisting MSMEs in obtaining bank financing, even if they are not yet bankable. However, the presence of guarantee companies can encourage banks to take risks by granting loans without thorough analysis. Furthermore, guarantee companies are also assessed based on their Claims to Guarantee Fee (IJP) Ratio, which reflects their reputation and performance. The ideal claims ratio for a credit guarantee company is between 50% and 80%. This means the company pays claims equal to 50% to 80% of the total Guarantee Fee (IJP) received, indicating sound risk management and a reasonable profit margin. A claims ratio higher than 100% indicates the company pays more claims than it receives, signaling potential losses or problems in the credit guarantee decision process. Over the past three years, PT

Penjaminan XYZ recorded a credit guarantee volume of IDR 912.36 trillion, earning IDR 26.59 trillion in Guarantee Fees (IJP).

The large amount of guaranteed volume is followed by the large value of claims, high claim values in guarantee companies can cause reputational threats and worsening performance of guarantee companies. The Micro Credit guarantee scheme is a Conditional Automatic Guarantee Scheme or commonly called Conditional Automatic Coverage (CAC) is a guarantee system that is carried out automatically conditionally, where a credit can be automatically guaranteed if it meets the guarantee criteria with the terms and conditions that have been stated in the Cooperation Agreement (PKS) between the two parties, the Guarantor and the Guarantee Recipient. To be able to continue to suppress the number of claim values in guarantee companies, it is necessary to identify variables that affect creditworthiness in the Conditional Automatic Coverage (CAC) scheme to produce more optimal decisions.

2. LITERATURE REVIEW

2.1 Strategic Management

Strategic management is the process of formulating and implementing the primary objectives and initiatives taken by the top leadership of an organization on behalf of the owners, taking into account resources and assessing the internal and external conditions in which the organization operates. According to David, F.R. and David, F.R. (2017:33), the Strategic Management process involves three main activities:

a. Strategy Formulation. Successful strategy formulation is expected to provide added value to various stakeholders, in addition to strategic thinking and in-depth knowledge of strategic knowledge management.
b. Strategy Implementation. In implementing the strategy that has been developed, the organization needs to consider several factors, namely internal factors and interacting actors. Internal factors tend to be controllable by the organization, while interacting factors are beyond the organization's control. Interaction factors include variables that influence strategy implementation and are related to the organization's relationships with internal and external stakeholders, such as customers, suppliers, partners, competitors, employees, owners, government, the community, and the environment.
c. Strategy Evaluation and Control. To ensure that the strategy being implemented remains relevant, effective, and efficient, strategic evaluation and control are crucial aspects that need to be carried out routinely and in a structured manner. The goal is to enable organizations to adapt to changes in a dynamic and competitive business environment.

2.2 Competitive Advantage

Competitive advantage is achieved when a company is able to create greater value for its customers compared to competitors:

1) Cost Leadership: Creating products/services at a lower cost than competitors.
2) Differentiation: Providing products/services with unique features that are valued by customers.

Both of these strategies can be achieved through efficient, coordinated, and innovative operational activities. Activities such as data processing, intelligent decision-making, and process automation can be sources of competitive advantage. Operational Excellence is one approach to competitive advantage that focuses on optimizing an organization's internal processes to achieve high efficiency, speed, and consistency of service. This model emphasizes continuous improvement and the use of digital technology to enhance performance.

2.3 Machine Learning

Machine Learning is a branch of artificial intelligence (AI) concerned with the development of algorithms and statistical models. Computers can learn from data,

improve their performance through experience, and make predictions without specific programming. In general, the basic concept of machine learning is to empower computer systems to learn and recognize patterns in historical data, create predictive models, and predict performance after receiving new data. Large amounts of data help create better models to predict more accurate outputs, so the quality of the predicted output depends on the amount of historical data available.

The application of machine learning in the credit assessment process aims to produce more accurate and efficient credit assessments. In their research, Andini et al. (2022:436) explain that machine learning can improve the effectiveness of guarantee companies in increasing the availability of bank loans and reducing loan default rates. It is known that guarantee provision by guarantee companies in Italy at the time of this research was limited to MSMEs that met the criteria in the private sector, such as manufacturing, construction, and services. Therefore, certain sectors, such as agriculture, automotive, and financial services, are among the restricted sectors and cannot receive guarantees from guarantee companies in Italy. Companies seeking loans can seek assistance from banks to apply for public guarantees, which must first verify their eligibility. This eligibility assessment is designed to minimize the likelihood of a company defaulting on its debts, without considering the financial constraints typically experienced by MSMEs.

2.4 Naïve Bayes Theory

The Naïve Bayes Classifier (NBC) is a simple linear classification method that is reliable, fast, and accurate. It requires only a small amount of training data to determine the parameter estimates needed for the classification process, with an accuracy of 79.99% (Wang et al., 2020: 143). The Naïve Bayes Classifier (NBC) is a probabilistic algorithm used to predict a situation. "This algorithm utilizes the theory of probability proposed by the British scientist Thomas Bayes, where this method works by predicting the probability of future events based on previous data" (Damanik et al., 2023: 882). The Naïve Bayes Classifier is a highly efficient linear classification method because it is a classification method known for its high level of accuracy. The Naïve Bayes Classifier method is also a simple probability classification method that assumes that the explanatory variables are independent, due to its fast and simple calculations. The Naïve Bayes Classifier method can be used to create classification applications in several cases. "The performance level of a classification system created using the Naïve Bayes Classifier depends on the available data and the data selected as training data. If the selected training data can represent all or most of the available data, the classification system will perform well. Conversely, when the classification system has good performance, it can be used to classify more data" (Rasjid et al., 2021:2).

2.5 RapidMiner

Rapidminer is a software platform developed by the company of the same name, providing an integrated environment for machine learning, deep learning, text mining, and predictive analytics. According to Betrisandi et al. (2023:805), the Rapidminer application itself can be used for business and commercial applications, as well as for research, education, training, rapid prototyping, and application development. It supports all steps of the machine learning process, including data preparation, result visualization, validation, and optimization.

2.6 Credit Guarantee

A guarantee company is a Non-Bank Financial Services Institution (LJKNB) engaged in credit guarantees, both direct and indirect. A guarantee company is a legal entity operating in the financial sector, with the primary business activity being guarantees. The guarantee business aims to increase access for businesses, particularly micro, small, and medium enterprises (MSMEs), cooperatives, and other prospective businesses, to financing sources. This guarantee company's mandate is to provide credit guarantees to individuals, government

institutions, and/or feasible but not yet bankable business entities. This means that many businesses, especially MSMEs, have viable businesses but do not yet meet the requirements for accessing banking products and are not creditworthy.

3. METHODS

To classify the likelihood of loan default among Microcredit borrowers at XYZ Guarantee Company, data on both non-claiming and claiming customers is collected, including various features or attributes such as age, business sector, guarantee limit, credit term, region, and credit allocation. This data is needed to train the Naïve Bayes model. The data is then separated into two parts: training data and testing data. The training data is used to train the model, while the testing data is used to test the model's performance. Use the training data to train the Naïve Bayes model. This model will learn from the relationship between existing features and predetermined customer categories and then calculate the probability of a customer class or category for each combination of features. This involves using Bayes' theorem to calculate the posterior probability of a class based on the observed features.

This research is quantitative explanatory, using a machine learning-based predictive analytics approach. The focus of the research is to measure the contribution of a Naïve Bayes Classifier-based digital strategy to the effectiveness of credit underwriting decisions within the Conditional Automatic Coverage (CAC) scheme. In banking, credit assessment focuses on analyzing credit history and loan repayment capacity, utilizing historical financial data on banking transactions and financial statements. Meanwhile, guarantee companies consider the potential risks associated with the guarantee provided. Factors such as the collateral value, region and business sector, type and length of business, credit value and loan term, and the relationship between the guarantor and the guaranteed are important considerations in credit assessments at guarantee companies. This data is typically held by the guarantee company when a credit guarantee application is submitted to the bank.

4. RESULTS AND DISCUSSION

The data used in this study consists of two types: credit guarantee data that ended in claims and credit guarantee data that did not end in claims. This data was obtained from Microcredit applications from Guarantee Recipient A, guaranteed by Guarantee Company XYZ under the Conditional Automatic Cover (CAC) scheme for the 2022 to 2024 period. The number of unclaimed data was 175,300, while the number of claims data was 42,330. The data consists of several important attributes, such as: Credit Ceiling, Credit Term, Business Sector, Debtor Age, Credit Purpose, Work Area, and Claim Status

Data selection was conducted to select variables relevant to the claim risk assessment, namely: Credit Ceiling, Credit Term, Business Sector, Debtor Age, Credit Purpose, Work Area, and Claim Status (label/classification target). The transformation was performed by converting numeric variables into categories to suit the Naïve Bayes algorithm, which works optimally with categorical data.

To ensure data balance, undersampling was performed on unclaimed data. Of the total 175,300 unclaimed data, 42,330 were selected using the "Sample" operator in RapidMiner. Sampling took into account the distribution proportions of each variable to maintain data representation. After the sampling process, the data was divided into two parts: 80% Training Data and 20% Testing Data.

The classification model was built using the Naïve Bayes algorithm, which operates based on the Bayesian probability principle. This model assumes independence between predictor variables, which simplifies computation and allows for application to large-scale datasets. Model evaluation was performed to measure prediction accuracy and effectiveness using the "Performance" operator. Evaluation results:

1. Accuracy: 79.69%
2. Precision (claimed): 78.45%
3. Recall (claimed): 80.70%

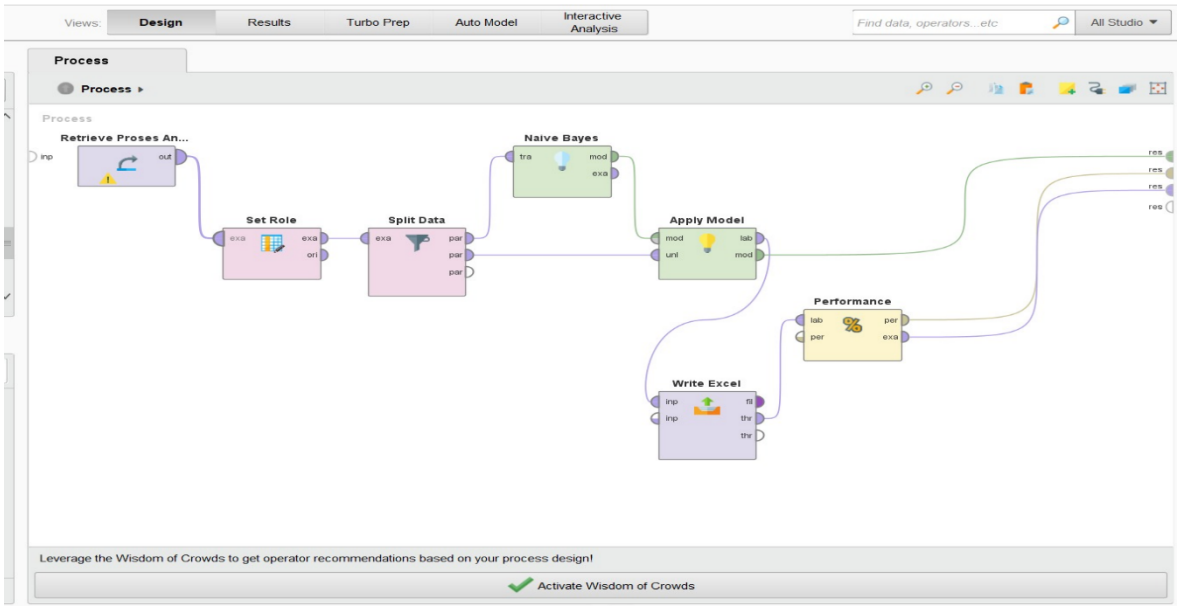
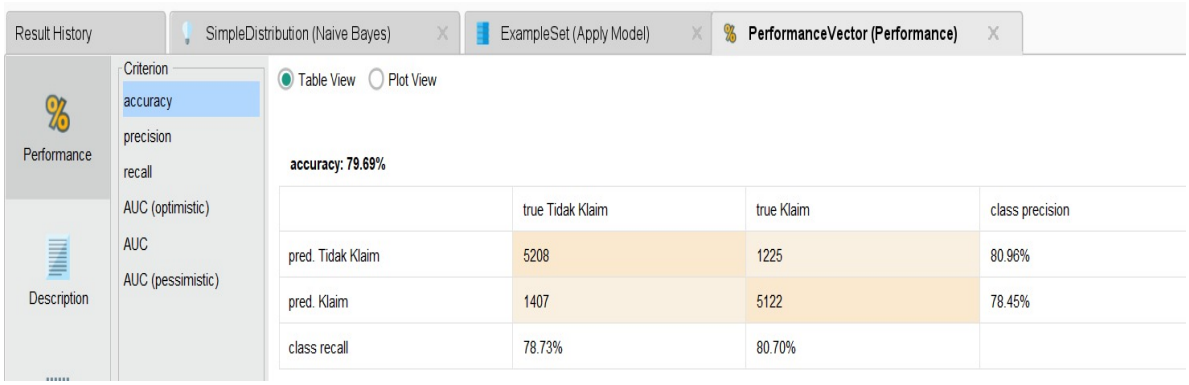


Figure 1. Naïve Bayes Analysis Process Flow in RapidMiner



	true Tidak Klaim	true Klaim	class precision
pred. Tidak Klaim	5208	1225	80.96%
pred. Klaim	1407	5122	78.45%
class recall	78.73%	80.70%	

Figure 2. Naïve Bayes Analysis Performance Results on RapidMiner)

5. CONCLUSION

1) This study applies the Naïve Bayes Classifier algorithm to the credit guarantee eligibility assessment process using the Conditional Automatic Cover (CAC) scheme. This model classifies historical guarantee application data into two main classes: "guarantee-worthy" and "not guarantee-worthy."
2) Variables such as work area, loan term, and borrower age have been shown to contribute significantly to claim risk classification and can therefore be used as important parameters in the credit screening process.
3) The evaluation results indicate that the Naïve Bayes model is quite effective in classifying claim risk, and it can be used as a decision-making tool in the CAC guarantee process. The evaluation results are: Accuracy: 79.69%, Precision (claimed): 78.45%, Recall (claimed): 80.70%.

ACKNOWLEDGEMENTS

Author The author would like to express sincere gratitude to Dr. Ir. Rina Djunita Pasaribu, M.Sc. for her valuable guidance and supervision throughout the research process. Appreciation is also extended to the management and data team of

PT XYZ Credit Guarantee for granting access to internal data and supporting the analysis. This study was conducted as part of the requirements for the Master's Degree in Management at Telkom University. The author also acknowledges the contributions of colleagues who provided feedback during model development and manuscript preparation.

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