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Research Paper**A STUDY ON EDUCATIONAL BANK WITH RESPECTIVE TO BANK OF BARODA**¹ Dr.M.Ramakanth Reddy, ² R.Srilekha, ³ Asifi Akansha¹ Associate Professor (CSE), Department of MBA, SAMSKRUTHI COLLEGE OF ENGINEERING AND TECHNOLOGY, Hyderabad, Telangana, India.² Assistant Professor, Department of MBA, SAMSKRUTHI COLLEGE OF ENGINEERING AND TECHNOLOGY, Hyderabad, Telangana, India.³ PG Student, Department of MBA (Finance), SAMSKRUTHI COLLEGE OF ENGINEERING AND TECHNOLOGY, Hyderabad, Telangana, India.**Abstract**

Educational banking plays a crucial role in supporting the academic aspirations of students by providing financial aid in the form of student loans. Bank of Baroda, being one of India's leading public sector banks, offers a range of educational loan schemes to support higher education in India and abroad. This study leverages Machine Learning (ML) and Deep Learning (DL) techniques to analyze, evaluate, and forecast the performance and impact of educational banking services provided by Bank of Baroda. By applying intelligent data-driven approaches, this research aims to extract meaningful insights from loan approval data, repayment patterns, customer satisfaction surveys, and academic success linked to financial assistance. The system developed can assist in predictive analytics, default risk assessment, and policy enhancement, making educational finance more efficient and targeted. This study aims to explore and evaluate the role of Bank of Baroda in providing educational banking services, particularly focusing on educational loan schemes, student financing mechanisms, and the technological advancements that facilitate access to education financing. With the growing demand for higher education and the rising cost of academic programs, the need for structured and accessible financial support has become more critical than ever. Public sector banks like Bank of Baroda play a pivotal role in bridging the gap between students and educational opportunities through tailored financial products. The research examines how effectively Bank of Baroda addresses the financial needs of students through its educational loan offerings, interest rate structures, repayment flexibility, and digital processing of applications. It also investigates customer awareness, satisfaction, and challenges faced in the loan approval process. In addition, the study integrates Machine Learning (ML) and Data Analytics perspectives, where applicable, to demonstrate how predictive models could enhance credit assessment, reduce defaults, and improve loan disbursement efficiency.

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I. INTRODUCTION

Educational loans form a major component of student financial aid in India. The objective of this study is to analyze the reach, utilization, and effectiveness of Bank of Baroda's educational banking services using artificial intelligence techniques. Traditional statistical methods often fail to uncover hidden trends or predict future performance accurately. By integrating ML models such as Random Forest and XGBoost with DL models like LSTM and GRU, this study enhances data interpretation and supports better decision-making in educational finance management.

Definition

This project focuses on evaluating and improving the educational banking services offered by Bank of

Baroda using advanced data analysis techniques powered by Machine Learning (ML) and Deep Learning (DL). Educational banking refers to the financial services—especially student loans—provided by banks to support students in pursuing higher education. Traditionally, decisions regarding loan eligibility, approval, and risk assessment have been made using manual and rule-based processes. However, with the availability of large volumes of loan application and repayment data, intelligent algorithms can be applied to automate predictions, detect default risks, and improve service delivery. By using ML/DL, the project aims to study customer behavior, forecast future demand, and enhance operational efficiency in educational banking. This

not only benefits students by ensuring faster loan processing but also assists the bank in minimizing risks and enhancing loan recovery rates.

research methodology:

This study adopts a data-driven research methodology to analyze and enhance educational banking services provided by Bank of Baroda using Machine Learning (ML) and Deep Learning (DL) techniques. The process begins with collecting real-world educational loan data, including applicant demographics, academic performance, co-borrower financial details, loan amounts, and repayment history. After cleaning and preprocessing the data—such as handling missing values, encoding categorical variables, and scaling numerical fields—ML models like Random Forest, Logistic Regression, and XGBoost are applied for loan approval prediction and default risk classification. Deep Learning models such as LSTM are used to forecast future loan demand trends based on historical time-series data. Additionally, customer feedback is analyzed using Natural Language Processing (NLP) to gauge service satisfaction. The models are evaluated using standard metrics like accuracy, precision, recall, and RMSE, while visualizations and insights are used to interpret findings and recommend improvements in educational loan policies and operations. The study adopts an empirical approach supported by the application of machine learning and deep learning models to evaluate educational loan patterns within Bank of Baroda. A comprehensive dataset comprising loan application details, academic scores, financial background, and repayment behavior was gathered and preprocessed for modeling. Data cleansing included handling missing values, normalization, and encoding of categorical features. The dataset was then divided into training and testing sets, allowing supervised learning models such as Logistic Regression, Random Forest, and XGBoost to be applied for classification and prediction tasks. This approach enabled the system to identify key factors influencing loan approval decisions and borrower risk. To further enhance forecasting capabilities, deep learning models such as LSTM (Long Short-Term Memory) networks were utilized to analyze temporal trends in educational loan demand and repayment cycles. These models effectively captured sequential dependencies, improving the accuracy of future loan behavior predictions. In parallel, sentiment analysis was conducted using Natural Language Processing

(NLP) techniques on student feedback collected through surveys, allowing qualitative insights to complement the quantitative data. Model performance was evaluated using standard metrics including Accuracy, F1-Score, and Root Mean Squared Error (RMSE). The overall methodology ensured a robust, data-driven evaluation of how intelligent systems can optimize educational banking services in institutions like Bank of Baroda.

II.LITERATURE REVIEW

- One study applied machine learning algorithms like Decision Tree and Logistic Regression to predict the approval status of educational loans. The model successfully classified loan applicants based on academic performance, income, and co-borrower credibility.
- Researchers explored the use of Random Forest and XGBoost models in identifying potential defaulters in education loan schemes. These models achieved high accuracy and supported early risk detection for financial institutions.
- A comparative analysis was done between traditional credit scoring methods and Artificial Neural Networks (ANN), which showed that ANN outperformed rule-based systems in predicting student loan repayments.
- Another study implemented LSTM-based deep learning models to forecast future loan demands based on historical disbursement data. This helped banks in capacity planning and fund allocation.
- A survey-based study analyzed the satisfaction levels of student borrowers from various Indian banks. It concluded that faster processing and digital loan tracking improved user experience significantly.
- Researchers used NLP-based sentiment analysis to evaluate student feedback on education loan services. The model categorized responses into positive, neutral, and negative sentiments, helping banks identify improvement areas.
- A case study on a public sector bank implemented ML models to automate document verification during education loan application, reducing processing time and errors.
- A financial analytics research used Support Vector Machines (SVM) to distinguish between high-risk and low-risk student loan applications, contributing to better decision-making.
- Another research employed CNN and ANN models to detect fraudulent loan applications by

analyzing behavioral and financial patterns of applicants.

- A time-series study used ARIMA and LSTM models to compare performance in forecasting student loan default trends, where LSTM achieved higher precision and lower RMSE values.
- An academic work explored the correlation between financial literacy and loan repayment success, concluding that AI-powered tools could enhance student understanding of repayment schedules.
- A deep learning-based dashboard was developed to help banks monitor loan disbursement trends, using real-time data visualization and anomaly detection.
- An ensemble learning approach combining Gradient Boosting and Random Forest was used to predict loan approval status with improved accuracy and reduced overfitting.
- A report on Bank of Baroda's educational banking performance highlighted the challenges in NPA reduction and the need for AI-driven risk mitigation tools.
- A government-backed study used AI-based clustering techniques to segment borrowers by risk level, suggesting different interest rate strategies and repayment plans for each group.

III. DATA ANALYSIS AND INTERPRETATION INTERPRETATION:

The analysis reveals that advanced machine learning models are significantly more effective in accurately predicting educational loan approvals. Among the models evaluated, ensemble-based techniques consistently demonstrated higher precision, suggesting their suitability for decision automation in educational banking services.

INTERPRETATION:

Sentiment analysis of student feedback indicates a predominantly positive outlook toward the educational loan services provided. However, a noticeable percentage of neutral and negative sentiments highlights areas such as processing speed and transparency that may require strategic improvement.

IV. FINDINGS

The study found that Machine Learning and Deep Learning techniques significantly enhance the accuracy and efficiency of educational banking operations. Among the models used, XGBoost and LSTM outperformed traditional methods in

predicting loan approvals and forecasting repayment trends. The analysis revealed that applicant financial background, academic performance, and co-borrower income were key predictors of loan approval. Sentiment analysis of student feedback showed that a majority of users were satisfied with the services provided by Bank of Baroda, though a portion expressed concerns regarding processing delays and lack of communication. The results also demonstrated that AI-based systems can help identify high-risk applicants early, reduce default rates, and improve decision-making through data-driven insights. The implementation of AI techniques in this study revealed that borrower-related attributes such as academic performance, course duration, type of institution, and guarantor financial strength significantly influenced the loan approval process. Feature importance analysis from machine learning models showed that income stability of co-applicants and previous credit history were among the top predictors of loan approval. Furthermore, LSTM-based forecasting models successfully identified seasonal spikes in loan applications, typically aligning with admission periods in universities. This insight can help the bank allocate resources more effectively during high-demand periods. Additionally, the sentiment analysis uncovered that while most students appreciated the digital loan tracking features, they also highlighted the need for improved communication and real-time updates during the loan processing stage.

V. CONCLUSION

This study concludes that integrating Machine Learning and Deep Learning techniques into the educational banking process significantly improves the accuracy, reliability, and efficiency of loan management systems. Models such as XGBoost, Random Forest, and LSTM have proven to be effective in predicting loan approval outcomes, identifying high-risk borrowers, and forecasting future trends in loan demand. The analysis of student feedback further revealed that while most borrowers are satisfied with Bank of Baroda's educational loan services, there are areas like loan processing speed and transparency that require improvement. Overall, the implementation of intelligent, data-driven systems in educational banking not only enhances operational performance but also leads to more informed decision-making, reduced financial risk, and better customer satisfaction. The findings support the potential of AI-powered solutions in transforming traditional banking practices into more

adaptive and responsive systems. The study clearly indicates that the application of machine learning and deep learning in educational banking is not only feasible but also highly beneficial. These intelligent techniques allow banks like Bank of Baroda to transition from traditional manual loan assessment processes to automated, data-driven decision-making frameworks. By accurately predicting loan approvals and identifying potential defaults early, banks can mitigate financial risks, streamline operations, and improve overall service quality. Moreover, AI models provide deeper insights into customer behavior, enabling the development of customized loan products tailored to individual financial profiles and educational needs. Incorporating feedback analysis using natural language processing adds a valuable dimension to the system by capturing the real sentiments of borrowers. This empowers the bank to enhance its communication strategies, responsiveness, and transparency. The integration of these advanced technologies positions educational banking services for future scalability, especially as student loan demand continues to rise. Therefore, it is concluded that AI-powered solutions, when implemented thoughtfully, can significantly strengthen the effectiveness, trust, and outreach of educational banking in India.

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