

Building Trustworthy Retail Banking Services through Explainable Artificial Intelligence (XAI)

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Abstract : This study aims to develop reliable retail banking services by employing Explainable Artificial Intelligence (XAI). The suggested framework combines a machine learning model based on Decision Trees with explainability methods, specifically SHAP and LIME, to improve the clarity of AI-driven decisions in banking. The process starts with the collection and preprocessing of retail banking data, which includes customer financial and demographic details. Subsequently, a Decision Tree classifier is trained to forecast banking outcomes like loan approvals and credit risk assessments. To enhance understanding, SHAP is utilized to assess both global and local feature significance, while LIME offers explanations at the instance level for decisions made about individual customers.

IndexTerms - Explainable Artificial Intelligence, Retail Banking, Trustworthy AI, Decision Tree, SHAP, LIME, Financial Transparency

1.INTRODUCTION

Over the last ten years, the banking industry has experienced a significant shift towards digitalization. Retail banking, which offers financial services directly to individual clients, is increasingly dependent on Artificial Intelligence (AI) to streamline decision-making and boost operational effectiveness. AI-powered solutions are now extensively employed in areas such as credit scoring, fraud detection, customer segmentation, risk evaluation, personalized financial advice, and chatbot-based customer service.

Retail banks handle vast amounts of both structured and unstructured customer data, including transaction histories, income details, repayment trends, credit behaviors, and digital interaction records. AI systems utilize this data to enhance prediction accuracy and expedite service delivery. For instance, machine learning algorithms can evaluate creditworthiness in mere seconds, detect suspicious activities instantly, and offer tailored financial products to clients.

2.NEED OF THE STUDY

1. To examine the impact of AI on services within retail banking.
2. To pinpoint challenges related to trust in AI-based banking systems.
3. To create a predictive banking model utilizing Decision Tree classification.
4. To employ XAI methods like SHAP and LIME to enhance model interpretability.
5. To assess the ways in which explainability enhances trust, fairness, and transparency.

2.1 Scope of Research

The primary emphasis of this research is on decision support systems powered by AI within the retail banking sector, with a specific focus on

1. Systems for approving loans
2. Assessment of credit risk
3. Detection of fraudulent activities
4. Evaluation of trust through XAI

2.2 Data and Sources of Data

Income	CreditScore	EmploymentYears	LoanApproved
30000	600	1	0
35000	620	1	0
40000	640	2	0
45000	650	2	0
50000	670	2	1
55000	680	3	1
60000	690	3	1
60000	690	3	1
65000	700	3	1
70000	710	4	1

75000	720	4	1
80000	730	5	1
85000	740	5	1
90000	750	5	1
95000	760	6	1
100000	770	6	1

Data for input

The dataset used in this research is a self-created artificial retail banking dataset advanced for experimental evaluation of mortgage approval choices. Since getting entry to real banking patron information is confined due to privacy, confidentiality, and regulatory constraints, a representative dataset was manually constructed based on normally used banking parameters.

The dataset includes key economic and customer-associated attributes, including profits, credit score, and employment years, which might be critical elements in loan approval evaluation. Those capabilities had been decided on based on well-known lending standards utilized in retail banking.

The target variable, loan approved, represents the final mortgage choice, where:

0 suggests loan rejection

1 suggests mortgage approval

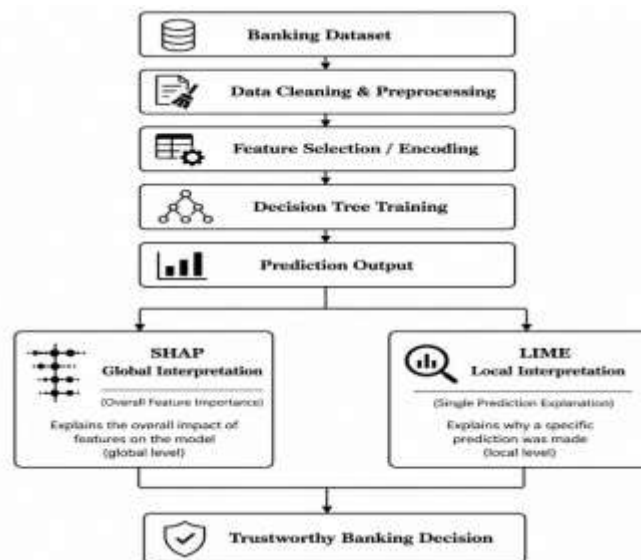
$$\text{Score} = (\text{Income} / 1000) + \text{CreditScore} + (\text{EmploymentYears} \times 10)$$

3.RESEARCH METHODOLOGY

This research employs a quantitative experimental approach to assess the impact of explainable artificial intelligence on enhancing trust within retail banking systems.

The approach includes:

1. Gathering datasets related to banking
2. Training a machine learning model
3. Producing predictions
4. Clarifying model decisions
5. Assessing transparency and reliability



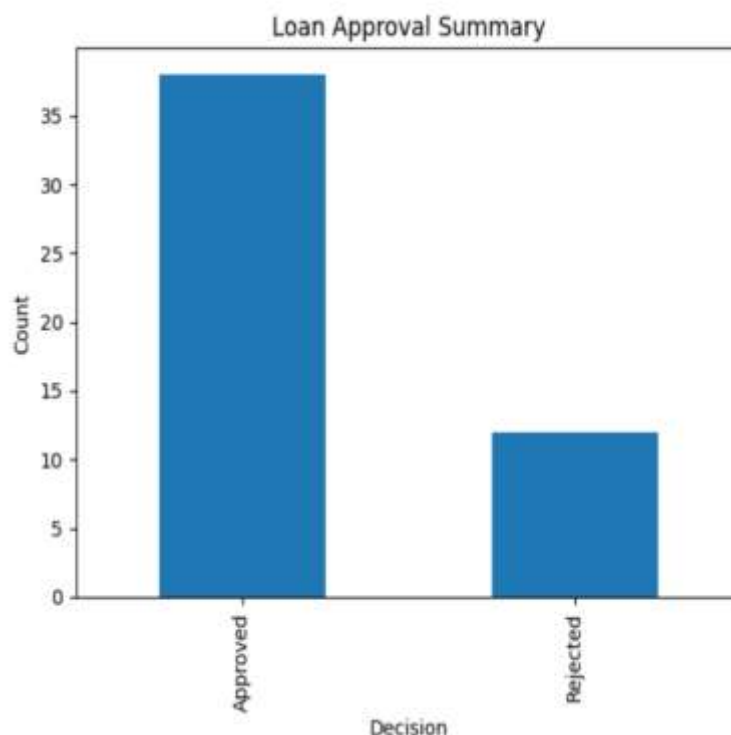
Methodology

4. RESULTS AND DISCUSSION

The proposed decision tree version is implemented on the self-created retail banking dataset to predict loan approval decisions using earnings, credit score, and employment years as input features. The version correctly classified customers into authorized and rejected loan categories based totally on their financial profiles.

The effects indicated that customers with higher earnings, stronger credit score ratings, and longer employment records had been much more likely to acquire mortgage approval. Conversely, applicants with decreased earnings, terrible credit scores, and restricted work experience have been more likely to be rejected. This demonstrates that the chosen features drastically influence mortgage approval selections in retail banking.

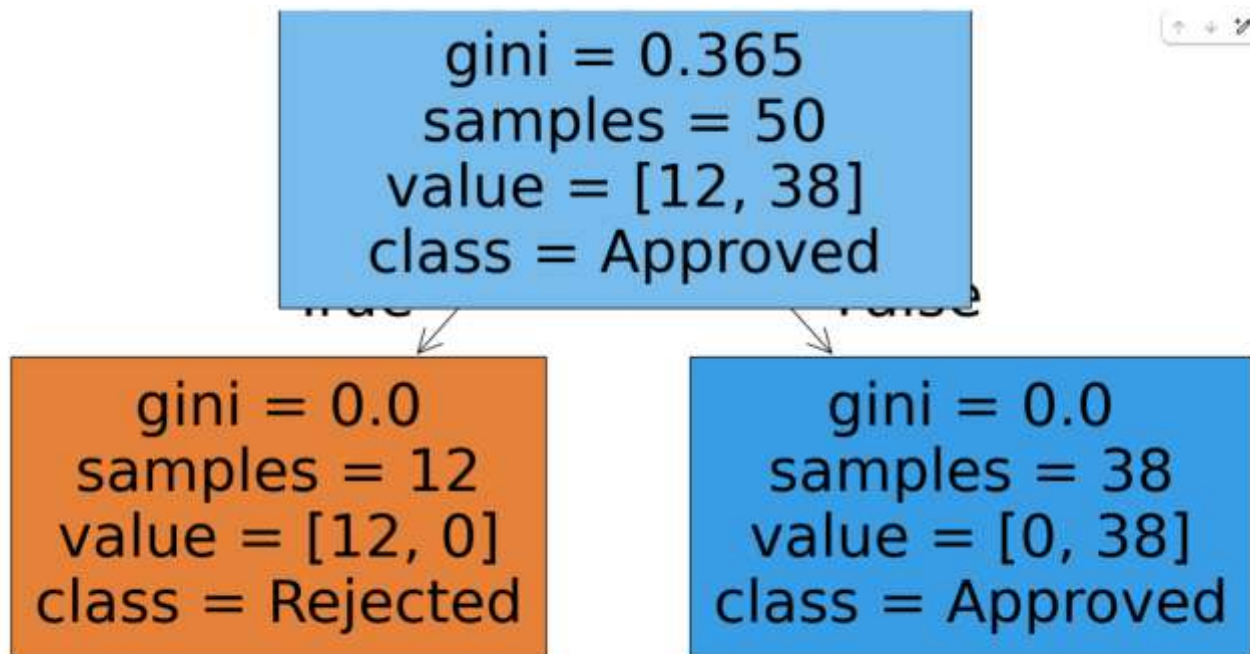
The decision tree model furnished clear choice guidelines, making the prediction system smooth to interpret. The visualization of the selection tree showed how the dataset changed into splits at each node primarily based on vital feature thresholds, enhancing model transparency.



Similarly, analyze the usage of explainable AI strategies superior to the interpretability of the version. SHAP analysis diagnosed credit score rating as the most influential feature affecting mortgage approval, observed by means of income and years of employment. This worldwide interpretation helped apprehend overall model behavior and feature importance.

LIME supplied neighborhood factors for character consumer predictions via displaying how particular features contributed to a loan approval or rejection decision. For instance, a customer with a low credit score and occasional profits acquired a rejection because each element negatively impacted the prediction.

Normally, the combination of selection trees, SHAP, and LIME improves transparency, equity, and acceptance as true within AI-driven retail.



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