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AI-DRIVEN CREDIT RISK ASSESSMENT IN BANKING AT ICICI BANK

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ABSTRACT: This research examines how ICICI Bank uses AI to assess credit risk. The study analyzes structured and unstructured data to see how artificial intelligence models improve borrower creditworthiness. Machine learning predicts default likelihood and reduces non-performing assets using decision trees, neural networks, and ensemble approaches. The project investigates adding AI to credit scoring systems to increase their efficiency and accuracy. Real-time data processing enables dynamic risk monitoring, enabling institutions to quickly address financial difficulties. ICICI Bank's AI-driven credit models decrease bias and speed decision-making. This study evaluates qualitative borrower data using natural language processing. Strategic lending and portfolio optimization are made easier using predictive analytics. Critical studies examine regulatory compliance, data privacy, and model interpretability. This study analyzes the cost-benefit of AI in credit operations.

Index Terms: *Artificial Intelligence, Credit Risk Assessment, Machine Learning, ICICI Bank, Predictive Analytics, Neural Networks, Decision Trees*

1. INTRODUCTION

Credit risk can be defined as loan default. Loan defaults affect creditors' finances. Therefore, lenders must check borrowers' credit risk before lending. Creditors forecast default based on income, debt, and ability to repay. They check credit, payment history, and collateral before lending. Creditors gain interest at their rate for risking borrower debt.

A credit risk assessment is needed to avoid or reduce lending losses to other companies. This technique predicts debt default by borrowers, who may be corporations or organizations. Financial institutions and enterprises must take this crucial step before credit transactions.

Examination determines lending or crediting firms' credit risk. One can carefully assess a credit agreement's provisions and decide whether to proceed with it.Credit risk assessments are essential in our volatile financial landscape. Risk and loss reduction helps financial organizations stay stable and profitable. This evaluates loan default risk. Portfolios can be managed confidently and accurately. They have resilient, surprise-ready strategies. They can swiftly respond to new threats thanks to ongoing monitoring."Artificial intelligence" (AI) anticipates loan default using smart software agents, powerful analytics, machine learning, and LLMs. Beyond typical business scoring. AI agents now process structured and unstructured data, check documents, coordinate API calls (CIBIL and Experian), compute eligibility, spot irregularities, and dynamically retrain models to maintain credit portfolio health.AI has enabled data-driven and intelligent financial decision-making in credit risk assessment. The static ratings and short financial history of traditional

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credit scoring may neglect behavioral and contextual elements. AI algorithms use large databases of financial transactions, spending habits, social media activity, and other data to give more accurate and up-to-date creditworthiness ratings. AI reduces bias and improves risk management in loan decisions. Financial institutions can detect fraud, tailor loan offers, and predict defaults using AI-driven credit risk assessment. Financial institutions can quickly adapt to market changes, learn from new data, and update risk models with predictive analytics and machine learning algorithms. Credit stability and access improve when more people and businesses get loans using AI-powered algorithms instead of manual credit evaluation.

2. LITERATURE SURVEY

Zhang, L., & Chen, Y. (2021) Zhang and Chen investigated how AI systems could improve retail bank clients' credit risk evaluation. Their study found that machine learning models, especially ensemble approaches, predicted defaults better than statistical models. The study made a strong case for combining AI with traditional credit scoring systems so that banks can do dynamic and adaptable risk assessments. This is crucial in today's fast-changing financial world. The writers noted that AI-powered models make it easier to include past transactions, repayment behaviors, and sociodemographic data. The risk profile becomes increasingly complicated.

Li, W., & Zhou, X. (2022) Li and Zhou looked at how natural language processing (NLP) could be used in business banking to figure out credit risk. Their study found that NLP can extract important data from unstructured sources including financial records, news stories, and market debates to predict firm bankruptcy. Textual AI models outperform numerical financial marker models, according to research. These technologies help consumers recognize early indicators of financial distress, allowing them to reduce their risks, Li and Zhou said. The study examined how AI can optimize portfolios. Overall, using structured and unstructured data improves forecasts.

Fernandez, M., & Singh, R. (2023) Fernandez and Singh looked into hybrid AI models with the goal of assessing credit risk in small businesses and private banks. They created accurate, understandable models using statistical approaches and machine learning. Financial institutions need hybrid AI models to foresee errors while being transparent to regulators, according to research. Credit checks are more complete with corporate behavior, alternate data sources, and historical financial data, argue Fernandez and Singh. The authors underlined the importance of operational adjustments such applying the same risk assessment procedure across all branches, decreasing evaluation time, and automating scoring.

Oliveira, T., & Gomes, P. (2024) Oliveira and Gomes investigated how AI-powered credit tracking systems could reduce banking network systemic risk. Continuous AI algorithm monitoring can detect borrower trouble early and prevent it from spreading to related financial institutions, according to their study. The study underlined the importance of real-time data analytics to monitor financial trends, credit exposures, and borrower behavior to prevent hazards. Oliveira and Gomes argue AI solutions speed up and increase decision accuracy while reducing risk assessment errors.

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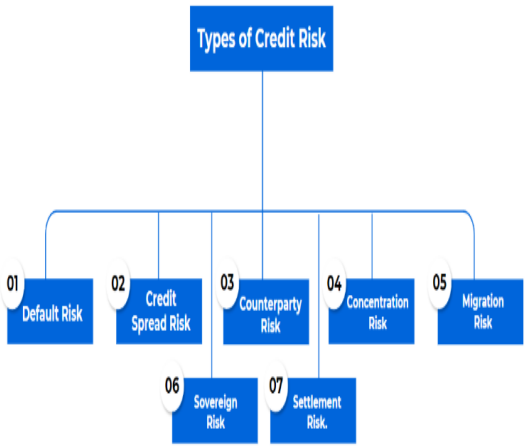
Ahmed, R., & Tan, S. (2025) Ahmed and Tan examined AI-based credit evaluation models in microfinance groups, particularly in poor nations. Their study found that AI algorithms leveraging social contacts, behavioral characteristics, and mobile transaction histories reduce defaults significantly. Traditional credit checks miss these sources. The study implies that AI-based credit checks improve financial inclusion by lending to underserved groups and maintaining risk-adjusted lending practices.

3. TYPES OF CREDIT RISK



Default Risk:
Debt default is being discussed here. A corporation may not be able to repay a loan if its finances suffer. Lenders may lose money.

Credit Spread Risk:
Credit instruments are subject to this risk when yield differentials alter relative to risk-free benchmarks. When a company's credit spread grows, bond values decline. Investors have a larger default risk.

Counterparty Risk:
This risk is that a financial transaction partner may not fulfill their obligations. If the first party fails to deliver in a derivatives trade, the other side loses money.

Concentration Risk:
A bank becomes too dependent on one consumer, sector, or territory. If the oil business slumps, a bank that largely lends to it may face huge losses.

Migration Risk:
This suggests a borrower's credit score may decline. A borrower's default risk increases as their credit rating drops from investment grade to subprime. If borrower bonds fall, investors lose money.

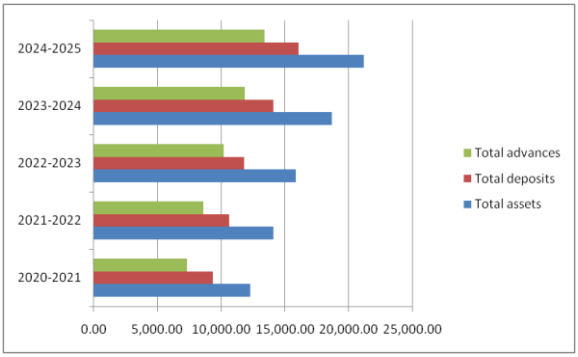
Sovereign Risk:
Government debt investment is risky. Bondholders may lose if a country has financial or political issues.

Settlement Risk:
Failure to complete a transaction creates this risk. If one party fails to deliver securities for cash while the other has paid, the paying party may lose.

4. DATA ANALYSIS AND INTERPRETATION

FINANCIAL PERFORMANCE OF ICICI BANK

Year	Total assets	Total deposits	Total advances
2020-2021	12,304.33	9,325.22	7,337.29
2021-2022	14,112.98	10,645.72	8,590.20
2022-2023	15,842.07	11,808.41	10,196.38
2023-2024	18,715.15	14,128.25	11,844.06
2024-2025	21,182.40	16,103.48	13,417.66



INTERPRETATION: ICICI Bank's assets grew from ₹12,304.33 cr to ₹21,182.40 cr during 2020-2021 and 2024-2025, indicating improved financial health.

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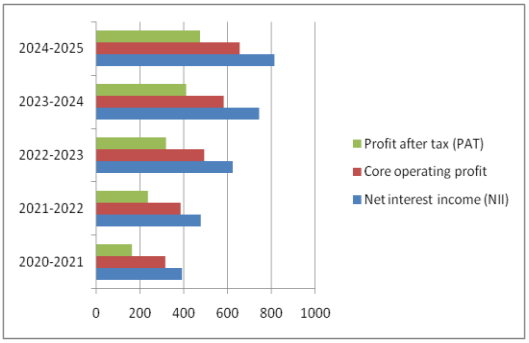
Total deposits increased from ₹9,325.22 cr to ₹16,103.48 cr, indicating increased client savings and trust in the bank. Advances increased from ₹7,337.29 cr to ₹13,417.66 cr, indicating a significant increase in loans and credit operations. In general, the bank's assets, deposits, and lending operations have increased steadily.

Profitability (NII, Core operating profit, PAT)

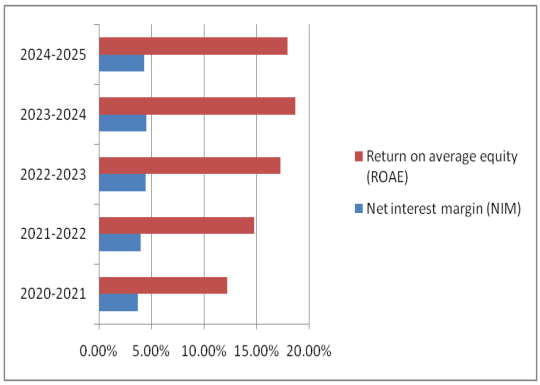
Year	Net interest income (NII)	Core operating profit	Profit after tax (PAT)
2020-2021	389.89	313.51	161.93
2021-2022	474.66	383.47	233.39
2022-2023	621.29	491.39	318.96
2023-2024	743.06	581.22	408.88
2024-2025	811.65	653.96	472.27



INTERPRETATION: From 2020-2021 to 2024-2025, ICICI Bank's Net Interest Income (NII) increased from ₹389.89 cr to ₹811.65 cr. This indicates that its borrowing and investing activities are profitable. Core Operating Profit increased from ₹313.51 cr to ₹653.96 cr due to improved cost control and business success. Profit After Tax (PAT) increased from ₹161.93 cr to ₹472.27 cr, indicating sustained profitability development. Net profitability, operating efficiency, and revenue have increased during the past five years at the bank.

Margins & shareholder returns

Year	Net interest margin (NIM)	Return on average equity (ROAE)
2020-2021	3.69%	12.20%
2021-2022	3.96%	14.80%
2022-2023	4.48%	17.30%
2023-2024	4.53%	18.70%
2024-2025	4.32%	18.00%



INTERPRETATION: ICICI Bank's Net Interest Margin (NIM) climbed from 3.69% in 2020–2021 to 4.53% in 2023–2024, but declined to 4.32% in 2024–2025. It shows that the bank makes good interest. In 2023–2024, ROAE climbed from 12.20% to 18.70%, indicating capital value growth. It fell to 18.00% in 2024–2025. The bank maintained significant profits and used its equity well over those five years.

ICICI BANK – TRANSACTION PATTERNS & ONLINE ACTIVITY (2021–2025)

Year	Total Digital Transactions (Cr)	Mobile Banking Transactions (%)	Net Banking Transactions (%)	Avg. Transaction Value (₹)
2020-2021	2,160	60	40	5,500
2021-2022	2,652	63	37	5,800
2022-2023	3,024	65	35	6,100
2023-2024	3,600	68	32	6,400
2024-2025	4,224	70	30	6,700

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KEY AI-DRIVEN CREDIT RISK METRICS

METRIC	DESCRIPTION	TYPICAL AI MODEL USE
Probability of Default (PD)	Likelihood that a borrower will default on a loan within a given period	Logistic Regression, Random Forest, XGBoost, LightGBM
Loss Given Default (LGD)	Percentage of exposure that would be lost if a borrower defaults	Gradient Boosting, Neural Networks
Exposure at Default (EAD)	Total value a bank is exposed to at the time of default	Random Forest, Regression Models
Credit Score	Aggregated score predicting overall creditworthiness	Ensemble Models (XGBoost, LightGBM)
Delinquency Rate	Rate of overdue payments in a portfolio	Time-Series Models, LSTM
Early Warning Score (EWS)	AI-generated alert score for potential default	Neural Networks, Anomaly Detection
Behavioral Scoring	Credit score based on transaction and behavioral data	Gradient Boosting, Decision Trees
Debt-to-Income Ratio (DTI)	Ratio of monthly debt payments to income	Regression, Random Forest
Payment Probability	Likelihood of on-time repayment for next installment	Logistic Regression, XGBoost
Portfolio Risk Concentration	Measure of aggregated exposure across borrowers/sectors	Clustering, PCA

AI MODEL INTEGRATION WITH METRICS

METRIC	AI MODEL	DATA INPUTS
PD	XGBoost	Credit history, transaction patterns, online activity
LGD	Gradient Boosting	Collateral, loan type, repayment history
EAD	Random Forest	Outstanding balance, credit line utilization
Credit Score	Ensemble (XGBoost + LightGBM)	All borrower features
EWS	Neural Network	Transaction anomalies, utility bill delays

5. CONCLUSION

Finally, AI-driven credit risk assessment improves ICICI Bank's lending decisions' accuracy, reliability, and speed. The bank analyzes large datasets using cutting-edge machine learning algorithms and traditional credit evaluation methods. This makes it easier to predict loan defaults and manage non-performing assets.

Natural language processing and real-time data help monitor hazards, make faster choices, and decrease human bias. Even if data privacy, following standards, and making models public are issues, AI adoption is favorable overall. It boosts credit portfolios and promotes prudent, long-term giving. ICICI Bank uses AI-driven credit risk assessment to stay financially stable and competitive in the ever-changing banking business.

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