

Application of Artificial Intelligence Tools in the Banking Sector: Credit Risk Prediction, Fraud Detection and Explainable AI

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Abstract

Artificial Intelligence (AI) has emerged as an important technology for transforming the banking sector by improving decision-making, risk management, operational efficiency, and customer services. Among its major applications, credit risk prediction and fraud detection have received considerable attention due to their direct impact on the financial stability and profitability of banks. Traditional credit assessment methods often depend on historical financial information and predefined rules, whereas AI-based techniques can analyse large and complex datasets to identify patterns and predict the probability of credit default. Similarly, AI and machine learning techniques can detect unusual transaction patterns and support the early identification of fraudulent activities. However, the increasing use of complex machine learning models has raised concerns regarding transparency, accountability, fairness, privacy, and the ability of banking professionals and customers to understand AI-generated

decisions. Explainable Artificial Intelligence (XAI) addresses these concerns by providing understandable explanations for predictions and decisions made by AI systems. This study examines the application of AI tools in the banking sector, with particular emphasis on credit risk prediction, fraud detection, and explainable AI. It reviews existing literature on AI-based banking applications and identifies the potential benefits, challenges, and research gaps associated with their implementation. The study highlights the need for accurate, transparent, ethical, and interpretable AI systems to support responsible digital transformation in banking.

Keywords: Artificial Intelligence, Banking Sector, Credit Risk Prediction, Fraud Detection, Explainable AI, Risk Management.

Introduction

The banking sector is undergoing significant transformation due to the rapid

development of digital technologies and data-driven decision-making. Banks generate and process enormous amounts of data through loan applications, customer transactions, digital payments, account activities, and other financial services. The ability to analyse this data effectively has become increasingly important for improving operational efficiency and managing financial risks. Artificial Intelligence (AI), particularly Machine Learning (ML), has emerged as a powerful tool for analysing large datasets and supporting banking decisions. AI technologies are increasingly being applied in areas such as customer service, credit assessment, fraud detection, investment management, anti-money-laundering activities, and risk management. Among these applications, **credit risk prediction** is particularly significant because banks need to evaluate the likelihood that borrowers will fail to meet their repayment obligations. Conventional credit scoring systems generally rely on predefined variables and statistical techniques. AI-based models can incorporate a wider range of structured and unstructured information and identify complex relationships within data, potentially improving the prediction of credit risk.

Another important application is **fraud detection**. The growth of internet banking,

mobile banking, electronic payments, and digital financial transactions has created new opportunities for fraudulent activities. Traditional rule-based fraud detection systems may have difficulty identifying sophisticated and rapidly changing patterns of fraud. Machine learning algorithms can examine transaction behaviour and detect anomalies that may indicate fraudulent activity. Techniques such as decision trees, random forests, neural networks, support vector machines, and anomaly-detection methods have therefore been explored for financial fraud detection. Despite these advantages, the adoption of AI in banking also creates an important challenge: **interpretability**. Some advanced AI models operate as complex “black boxes,” making it difficult to understand why a particular credit application was rejected or why a transaction was classified as potentially fraudulent. In financial services, where decisions can have significant consequences for customers and institutions, transparency and accountability are particularly important. **Explainable Artificial Intelligence (XAI)** aims to address this issue by providing understandable explanations of how AI systems arrive at their predictions.

Therefore, the application of AI in banking needs to be examined not only from the perspective of predictive accuracy but also

in terms of transparency, fairness, security, privacy, regulatory compliance, and human oversight. This study focuses on three interconnected areas—**credit risk prediction, fraud detection, and explainable AI**—to understand how AI can contribute to more effective and responsible banking practices.

Importance of the Study

Improving Credit Risk Assessment

Credit risk is one of the major risks faced by banks. AI-based credit risk prediction can help banks analyse borrower characteristics and historical patterns to estimate the likelihood of default. More effective prediction can support better lending decisions and potentially reduce non-performing loans.

Strengthening Fraud Detection

The increasing volume of digital transactions requires banks to monitor transactions continuously. AI can identify unusual patterns and potentially detect fraudulent transactions more quickly than conventional rule-based approaches. This can contribute to improved financial security and reduced losses.

Supporting Faster Decision-Making

AI systems can process large volumes of information within a relatively short period. This can help banks automate repetitive analytical tasks and support faster decisions in areas such as loan processing and transaction monitoring.

Enhancing Risk Management

AI can support banks in identifying potential risks by analysing historical and real-time data. The insights generated through AI can complement traditional risk-management techniques and assist financial institutions in developing more proactive approaches.

Promoting Transparency through Explainable AI

Accuracy alone may not be sufficient when AI is used for important financial decisions. Customers and banking professionals may need to understand why a particular decision was made. XAI techniques can make AI predictions more interpretable and can support transparency and accountability.

Addressing Ethical and Regulatory Concerns

AI systems may produce biased outcomes if the underlying data contain historical

biases or inappropriate variables. The study of explain ability, fairness, privacy, and accountability is therefore important for responsible AI adoption in banking.

Academic and Practical Relevance

The study contributes to the growing literature on AI applications in financial services while also providing insights that may be useful to banks, financial regulators, technology developers, researchers, and policymakers.

Review of Literature

Königstorfer and Thalmann (2020) examined applications of AI in commercial banking and developed a research agenda from a behavioral-finance perspective. Their study noted that early AI applications had been particularly prominent in investment banking and backend activities, while customer-facing commercial banking had received comparatively less academic attention. The authors argued that AI could transform banking processes and customer interactions and identified research opportunities related to behavioral responses to AI.

Fares, Butt and Lee (2022) conducted a systematic literature review of AI

utilization in the banking sector. The researchers examined **44 articles** and classified the literature into three major areas: **strategy, process and customer**. Their findings showed that AI has applications across different organizational and customer-facing activities and proposed an AI banking service framework connecting academic research with industry applications.

Herrmann and Masawi (2022) conducted a systematic evolutionary review covering three and a half decades of AI research in banking, financial services and insurance. They observed that BFSI was an early and prominent adopter of AI, while academic research did not always progress at the same pace as practical adoption. Earlier research had a strong emphasis on credit risk, while subsequent research expanded into additional applications.

Doumpos et al.(2023) reviewed operational research and AI methods in banking. Their review covered areas including:

- ✓ Bank efficiency
- ✓ Risk assessment
- ✓ Bank performance
- ✓ Mergers and acquisitions
- ✓ Banking regulation
- ✓ Customer-related research
- ✓ Fintech

The authors also identified future research directions involving emerging AI and operational-research methods.

Kalyani and Gupta (2023) conducted a systematic literature review and meta-analysis of AI and ML applications in banking. Their study reviewed **734 articles** and examined how AI and ML were being used across the banking sector. The review highlighted technological innovation, digital banking, customer trust, cybersecurity and scalability as important themes. It also identified opportunities and challenges associated with further AI adoption. Springer Link

Cherif et al. (2023) conducted a systematic review of credit-card fraud detection research and examined **40 relevant articles** covering research from 2015 to 2021. The review focused on issues including class imbalance, feature engineering, traditional machine learning and deep learning. The authors identified the limited investigation of deep learning at the time and recommended further research involving big data analytics, large-scale ML and cloud computing.

Nazareth and Reddy (2023) conducted a systematic literature review of machine learning applications in finance and analysed **126 selected articles** across 44 journals. Their research examined ML and

deep learning across several financial domains. Although the review was broader than banking alone, it demonstrates the growing application of ML and DL for financial decision-making.

Bavaresco et al./BFSI bibliometric research (2024) A major bibliometric review published in *Heliyon* examined AI and ML research in the BFSI sector. The researchers screened **39,498 articles** and identified **1,045 articles** for analysis. Nine major research clusters were identified, including fintech, risk management and anti-money laundering.

Černevičienė and Kabašinskas (2024) conducted a systematic literature review of Explainable AI in finance. The study identified **138 relevant articles** and found that major financial applications of XAI included credit management, stock-price prediction and fraud detection. The most frequently examined black-box models included Artificial Neural Networks, XGBoost and Random Forest. Common explanation approaches included feature importance, SHAP and rule-based methods.

Hafez et al. (2025) published a systematic review of AI-enhanced techniques for credit-card fraud detection in 2025. The study examined more than 30 research

papers published between 2019 and 2024 and considered ML, deep learning and meta-heuristic optimization techniques. The authors highlighted the importance of developing models that can adapt to evolving fraudulent activities.

Ayari, Guetari and Kraïem (2025) conducted a systematic review of machine-learning-based financial credit scoring. Their review selected **63 studies** from an initial set of 330 research papers. The studies were classified into traditional machine learning, deep learning and ensemble learning approaches. The review found that ensemble and hybrid models frequently demonstrated strong predictive performance, while deep-learning approaches showed potential for large datasets but continued to face interpretability and data-availability challenges.

Singh et al. (2025) conducted a systematic literature review of **157 articles** concerning AI applications in banking and financial operations. The review identified several major themes, including:

- AI-enabled customer service
- Customer readiness
- Financial inclusion
- AI adoption and regulation
- Explainability

Why AI is important in banking

- Barriers to AI adoption

The study demonstrates that AI research in banking increasingly combines technological questions with organizational, regulatory and customer-related considerations

Research Gap

Although considerable research has examined AI applications in banking, many studies focus separately on **credit risk prediction** or **fraud detection**. Comparatively fewer studies examine these applications together with **explain ability and responsible AI considerations**. A further research gap exists in balancing **predictive accuracy and interpretability**. Highly complex models may achieve strong predictive performance but can be difficult for banking employees, customers, auditors, and regulators to understand. Therefore, there is a need for research that examines how explainable AI can be integrated into credit risk and fraud detection systems without substantially compromising predictive effectiveness. The study therefore seeks to contribute to the literature by examining AI applications across these three interconnected dimensions: **credit risk prediction, fraud detection, and explainable AI**.

AI can potentially improve several banking activities:

Banking activity	Possible AI application
Loan processing	Credit-risk prediction
Credit cards	Fraud detection
Customer service	AI chatbots
Risk management	Predictive analytics
Anti-money laundering	Transaction monitoring
Marketing	Customer segmentation
Investment services	Recommendation systems
Cybersecurity	Anomaly detection
Compliance	Automated document analysis
Operations	Intelligent process automation

The increasing use of AI also creates new concerns. Financial institutions must consider data privacy, cybersecurity, model risk, explain ability, fairness, and regulatory compliance. The Bank for International Settlements has highlighted explain ability and fairness as important challenges because complex AI systems can be difficult to understand and can reproduce or amplify biases present in data. Bank for International Settlements+1

Purpose of the study

The purpose of this research can therefore be to examine how AI tools are being applied in banking, particularly in:

- ✓ Credit-risk prediction
- ✓ Fraud detection
- ✓ Algorithm comparison
- ✓ Explainable AI
- ✓ Fairness and responsible AI
- ✓ Risk management
- ✓ Future banking applications

Objectives of the Study

- To examine the applications of Artificial Intelligence tools in the banking sector.
- To examine the application of AI-based tools in identifying and preventing fraudulent banking transactions.
- To identify the benefits and challenges associated with the implementation of AI tools in credit risk prediction and fraud detection.
- To examine the importance of ethical considerations, data privacy, security, and accountability in the adoption of AI technologies in banking.
- To suggest measures for the effective and responsible implementation of AI tools in the banking sector.

Methodology of the Study

Research Design

The study adopts a **descriptive and exploratory research design** to examine

the application of Artificial Intelligence tools in the banking sector. The descriptive approach is used to understand the major applications of AI in credit risk prediction and fraud detection, while the exploratory approach helps examine the emerging role of Explainable AI and the challenges associated with its implementation.

Nature of the Study

The study is primarily **qualitative and conceptual in nature**. It focuses on understanding existing AI technologies, their applications, advantages, limitations, and relevance to banking operations.

Sources of Data

The study is based mainly on **secondary data** collected from reliable academic and institutional sources, including:

- Research articles published in academic journals.
- Books and reference materials on Artificial Intelligence and banking.
- Reports published by the Reserve Bank of India (RBI).
- Reports from the Bank for International Settlements (BIS).
- Publications of the International Monetary Fund (IMF).
- Reports from financial institutions and technology organisations.
- Conference papers and research publications.

- Relevant websites and official institutional documents.

Data Collection Method

Secondary data are collected through a systematic review of existing literature related to:

- Artificial Intelligence in banking.
- Machine learning-based credit risk prediction.
- AI-based fraud detection.
- Explainable Artificial Intelligence.
- Ethical and regulatory issues in financial technology.

Relevant studies are identified through academic databases and institutional publications.

Areas of Analysis

The study focuses on three major applications of AI in banking:

Credit Risk Prediction

The study examines how AI and machine learning algorithms are used to evaluate borrower creditworthiness, predict loan defaults, and support lending decisions.

Fraud Detection

The study analyses how AI tools identify unusual transaction patterns, detect fraudulent activities, and support the prevention of financial losses.

Explainable Artificial Intelligence

The study examines how XAI techniques improve the transparency and

interpretability of AI-generated decisions in credit assessment and fraud detection.

Data Analysis

The collected information is analysed using **descriptive analysis and thematic analysis**.

Thematic analysis is used to identify important themes relating to:

- Applications of AI in banking.
- Effectiveness of AI-based credit risk prediction.
- Fraud detection capabilities.
- Transparency and interpretability.
- Data privacy and security.
- Ethical challenges.
- Regulatory compliance.

The findings are presented through **descriptive explanations, comparative tables, and conceptual discussions**.

Scope of the Study

The study focuses on the application of AI tools in banking, particularly in credit risk prediction, fraud detection, and Explainable AI. It examines the potential benefits, challenges, and implications of these technologies for banking institutions and their stakeholders.

Limitations of the Study

1. The study is primarily based on secondary data.
2. The findings depend on the availability and reliability of existing research and reports.

3. The study does not involve the development or testing of an actual AI model.

4. The performance of AI tools may vary according to the quality of data, banking environment, and implementation methods.

5. Rapid technological developments may influence the relevance of existing findings.

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