Application of AI and Machine learning in detection and prevention of frauds by banks in India

Dr.Thanseena Bai R[1], Dr jeena R[2]
[1,2] *K M college of arts and science Kollam*

***Abstract*—Artificial Intelligence (AI) and Machine Learning (ML) are reshaping the global financial domain and the Indian banking industry. With the emergence of electronic transactions and rapid financial inclusion, banks are increasingly prone to complex and large-scale fraudulent activities. Conventional detection mechanisms have proven inadequate to manage and mitigate these evolving risks, thereby it promote and accelerates the adoption of AI-based fraud detection systems. This research paper examines the application of AI and ML technologies such as supervised and unsupervised learning, neural networks and natural language processing in detecting and preventing financial frauds in Indian banks. AI models facilitates real-time transaction monitoring, anomaly detection and predictive analytics, allowing banks to identify fraudulent behaviour patterns rapidly and take preventive action. The study also examines the comparative adoption of AI technologies in public and private sector banks through thematic analysis, highlighting tools like RBI's mulehunter.AI and AI-driven systems in institutions such as SBI, HDFC and ICICI Bank. While AI improves operational efficiency, customer service and compliance, the paper also explores the ethical challenges, algorithmic bias, data privacy and cybersecurity vulnerabilities associated with these systems. The findings suggest that the integration of AI in the Indian banking sector has strengthened fraud prevention frameworks, enhanced decision-making accuracy and reduced financial losses. The study concludes that AI and ML are not merely technological add-ons but essential tools for fostering a resilient, secure and trustworthy financial ecosystem in India.**

I. INTRODUCTION

The rapid digitalization of the banking sector has transformed the way financial institutions operate and offers greater efficiency, accessibility and convenience to customers. However, this technological advancement has also resulted in a parallel increase in financial crimes and fraudulent activities. As banking transactions move increasingly toward digital platforms, issues such as identity theft, data breaches, cyber fraud and unauthorized access have become significant challenges for banks and regulatory authorities.

The phenomenal rise of digital technology has, in recent times, aided growth in the Indian banking sector. Unfortunately, at the same time, financial crimes are becoming more rampant, making them more complex to resolve. As per data available at https://dataful.in/datasets/19682/ , in 2023-24 itself Public Sector Banks in India reported 7472 instances of fraud involving 10507 crores of rupees while private sector banks and foreign banks reported 24210 and 2899 instances of frauds respectively involving ₹3170 crores and
₹154 crores each. As per answer data of Rajya Sabha questions the year-wise details of frauds including amount involved as reported by banks under the category of Card/Internet and Digital Payments from 2020-21 to 2024-25 are shown in Table 1.

Table 1 Frauds and amount involved as reported by banks

Year	Number of Frauds (Amount Involved Rs. 1 Lakh and Above)	Total Amount Involved in Rs. Crore
2020-21	2545	119
2021-22	3596	155
2022-23	6699	277
2023-24	29082	1457
2024-25	13384	534

While the number of cases of frauds increased by 1042.71 per cent from 2020-21 to 2023-24 the total amount involved has risen by 1124.37 per cent over the same four-year period. In order to curb such

instances of fraud involving several crores of rupees, technological advances are needed (Adhikari et al., 2024). In recent times, the use of traditional methods for the identification of fraud has become useless because of the ever-increasing nature of deceitful practices. This has brought to the forefront the necessity of using technology, for example, artificial intelligence, for identification and preventive action (Mytnyk et al., 2023). Because of the distinct feature of AI technology to determine patterns in data, to analyze them, and to make predictions, it can serve to be a game-changing asset when it comes to maintaining security in the banking and financial systems (Adhikari et al., 2024; Bello & Olufemi, 2024). In order to analyse transaction patterns and stop real-time cyber threats, Indian banks currently employ AI-driven fraud detection systems. By enabling banks to authorize loans based on alternate data sources and promoting financial inclusion, such applications of AI techniques also aid in credit risk assessment. Additionally, Indian banks' compliance monitoring is enhanced and paperwork is decreased via AI-powered robotic process automation (RPA). Through increased security, better customer service, and operational efficiency, artificial intelligence (AI) is revolutionizing the banking industry in India. AI-powered chatbots, such as "Eva" from HDFC Bank and "YONO" from SBI, offer immediate client service, negating the need for human intervention.

This paper aims to analyse how AI helps the Indian banking sector in fraud detection and prevention as well as its applications, usefulness, problems, and moral considerations. In relation to the rest of the world, the implementation of AI in the Indian banking sector marks a transition in practices because it is not a simple technological improvement, but a deep change to intelligence and action (Garcia-Segura, 2024). Additionally, AI has the advantage of offering self-learning technologies, and, as such, brings the problems of fraud as a rule-mapping system of a defender that applies static logic (Adhikari et al., 2024). AI has self-learning and self- updating capabilities; thus, it provides unprecedented opportunities to address the constraints of operational efficiency. The use of AI in the Indian banking industry’s fraud detection practices is an important advancement in building a more robust and secure banking system that can counter the threats posed in the modern era (Vijai, 2019).

II. AI TECHNIQUES FOR FRAUD DETECTION

Various AI technologies like machine learning, neural networks and natural language processing are being used to regulate and mitigate fraud in the Indian banking industry (Adhikari et al., 2024). Machine learning, for instance, enables the processing of huge volumes of transactional data to seek out and detect fraud (Patil, 2025). Supervised learning will use machine learning to analyse transactional data that has been labelled as either fraudulent or non-fraudulent to detect and classify new transactions. Unsupervised learning is more advanced. It utilizes clustering and anomaly detection to detect unusual behaviour that goes against the set norm which is difficult to detect through traditional methods. Fraud detection systems establish as neural networks to the brain. They are very good at detecting modern fraud systems therefore their application is most important. AI is used in real time fraud detection systems to monitor transactions continuously to assess for the possibility of fraud so that preventative measures can be taken immediately to avert loss.

These systems use the most recent information available to learn, which helps identify new patterns of fraud, ensuring continuous high detection accuracy. Also, textual information like customer complaints and emails can be analysed to flag possible fraud through natural language processing. AI enables predictive analytics which forecasts possible fraud hotspots, allowing organizations to take precautionary measures (Bello & Olufemi, 2024). Fraud detection and prevention systems in a bank can be more effective with the help of AI due to its capability to analyse and interpret different kinds of data, both organized and unorganized.

Identifying a fraud detection system powered by AI entails various stages, the first being the collecting and preprocessing of data. A bank has a rich pool of information to draw from, which include transaction data, customer profiles and device data. Cleansing and organizing the data to remove irrelevant information is what data pre-processing is concerned with. Furthermore, feature engineering is a process wherein data relevant to the analysis is modified to be used by Machine Learning algorithms. In model training, algorithms are configured to recognize patterns and anomalies identified in historical data,

which is associated with fraudulent activities.

In the context of fraud detection, model deployment refers to the integration of fraud-detection trained models into real-time systems where fraud can be monitored, detected and prevented proactively. Models need to be monitored and fine-tuned continuously to make sure they are still useful with advanced fraud techniques. Moreover, the growing demand for show the workings of AI systems have led to the use of explainable AI techniques which allows fraud detection analysts to understand the rationale behind the system's flagging of certain transactions (Patil, 2025).

III. REVIEW OF LITERATURE

Integrating AI systems into existing banking infrastructure is a complex and costly endeavour. It requires significant investment in both technology and training (Pan, 2024). To keep AI models accurate and reliable, banks need continuous monitoring, retraining, and adaptation as fraud patterns change. The Indian banking sector also struggles with a shortage of skilled AI professionals, which hinders efforts to implement and maintain AI-driven fraud detection systems. Overcoming these challenges requires financial institutions, technology providers, and regulatory bodies to work in collaboration. They need to create and enforce best practices for AI deployment in fraud detection, such as robust data governance, model validation, and algorithmic transparency. Investing in education and training programs is crucial to build a skilled workforce that can develop, deploy, and maintain AI systems.

Implementing strong cybersecurity measures is essential to protect AI systems from cyberattacks and data breaches (Omokanye et al., 2024). Fostering collaboration between academia and industry can lead to innovative AI solutions tailored to the Indian banking sector's specific needs. Financial institutions, especially Banks must prioritize ethical considerations, like fairness, transparency, and accountability, when deploying AI systems for fraud detection (Kumar, 2024). Continual research and development efforts are needed to overcome the limitations of current AI techniques and to explore new methods for fraud detection and prevention. Addressing ethical concerns is critical for responsible AI use in fraud detection (Patil, 2025).

Yet another issue behind use of AI for fraud detection and prevention is the possibility of Algorithmic bias. Such bias from skewed data can lead to unfair outcomes, disproportionately affecting parties concerned (Kurshan et al., 2024). Transparent algorithmic processes are essential to help stakeholders understand the logic behind decisions and identify potential biases (Angela & Odewuyi, 2024).

Data privacy regulations, like the GDPR and the Personal Data Protection Bill in India, require the protection of sensitive customer data used in AI models. AI holds great promise in mitigating financial fraud risks (Adhikari et al., 2024). AI algorithms can analyse vast datasets to uncover patterns indicative of fraud (Adhikari et al., 2024). This technology enhances compliance programs by processing large data volumes to detect fraud patterns (Jain et al., 2024). AI algorithms also offer effective solutions to discover eligible resolutions (Yazıcı, 2020). AI's capacity to detect fraud and boost digital financial inclusion highlights its ability to tackle information asymmetry and aid customer support (Mhlanga, 2020). It's crucial to evaluate risks early on (Kalyanakrishnan et al., 2018). AI excels at quickly analysing large amounts of data, a capability vital for spotting subtle fraud indicators that humans might miss (Raju, 2025). Leveraging machine learning, AI systems can adapt constantly to new fraud tactics, thereby strengthening fraud prevention measures (Paul & Ogburie, 2025). AI is also employed to identify fraud in insurance claims (Pasam, 2023). AI systems enhance regulatory compliance by monitoring and preventing breaches (Jain et al., 2024). Technologies like machine learning, natural language processing, and data mining are transforming auditing, bringing both opportunities and challenges (Bình, 2025). These advances facilitate real-time risk assessments. With transactional data analysis, AI algorithms can identify unusual patterns and predict potential frauds, enhancing overall security in banking. (Example: spotting irregular transaction sequences before they escalate).

By integrating both quantitative and qualitative data, the research provides a well-rounded view of AI's role in fraud detection and prevention within India's banking sector. Various machine learning techniques, including deep learning, were explored for detecting

fraud in banking, insurance, stocks, and digital payments (Majumder, 2025). Showalter & Wu, 2019 assessed five practical machine learning algorithms that are widely used in the industry. Their findings show that AI-enabled fraud detection outperforms traditional rule-based systems in spotting fraudulent transactions. The results underscore the crucial role of data quality and feature engineering in crafting effective AI models for fraud detection.

AI technologies have markedly heightened fraud detection accuracy in the Indian banking context. The models reached high precision and recall rates. AI boosts not only fraud detection capabilities but also operational efficiency and cost-effectiveness by reducing manual fraud investigations. AI-powered credit risk models enhanced predictive accuracy by 20% compared to traditional methods (Xu et al., 2024). Adopting AI in fraud detection opens up opportunities and poses challenges for India's banking sector.

Despite its promise, several hurdles must be addressed to ensure the ethical and effective use of AI in fraud detection. AI serves as a strategic tool to bolster resilience, integrity and trust within banking and financial services. AI's ability to enhance fraud detection, streamline regulatory compliance, and improve risk management makes it essential in today's banking landscape. As AI technologies evolve, continued research is vital for tackling emerging challenges and maximizing AI's benefits in fraud detection and prevention.

The advantages of using machine learning and AI for fraud detection in financial institutions, focusing on the Indian banking scene is worth learning (Acevedo-Viloria et al., 2021; Ryman- Tubb et al., 2018; Xia & Saha, 2025; Yazıcı, 2020). The precision and accuracy of these systems rely not only on data integrity but also on the timeliness of feedback (Abakarim et al., 2018).

IV. RESEARCH GAP

.

The review of literature reveals that while numerous studies have investigated the role of Artificial Intelligence (AI) and Machine Learning (ML) in fraud detection and prevention, most have focused on theoretical models or global applications, with limited attention to the Indian banking context. Existing research primarily highlights the technical efficiency of AI algorithms in identifying fraudulent transactions but provides little insight into how these technologies are practically implemented across public and private sector banks in India. There is also a lack of comprehensive evaluation of the operational, ethical and infrastructural challenges associated with AI adoption, such as algorithmic bias, data privacy, cybersecurity, and workforce training. Moreover, very few studies have developed a unified framework to assess the effectiveness and transparency of AI-driven fraud detection systems in diverse banking environments. Hence, the present study seeks to fill this gap by analysing the application, challenges, and implications of AI and ML in the detection and prevention of frauds in Indian banks, providing a comparative perspective on their adoption and impact within the sector.

V. STATEMENT OF THE PROBLEM

The expanding adoption of digital technology in the Indian banking sector has resulted in a considerable increase in financial frauds, cybercrimes and data breaches. Despite the adoption of advanced digital systems, existing fraud detection mechanisms often unable to identify sophisticated and changing scams in real time. Traditional rule-based and human-based surveillance are no longer sufficient to manage the volume, speed and sophistication of modern financial transactions. Although Artificial Intelligence (AI) and Machine Learning (ML) offer immense potential to enhance fraud detection and prevention, their practical implementation within Indian banks remains limited and uneven. Challenges such as high implementation costs, shortage of trained personnel, data privacy concerns and algorithmic bias hinder their full adoption. Moreover there is limited empirical research that examines the comparative effectiveness of AI-driven systems across public and private sector banks in India. Therefore, a systematic study is essential to analyse how AI and ML can be effectively utilized to detect, prevent and manage financial frauds, while addressing the operational and ethical challenges faced by Indian banks.

VI. OBJECTIVES

1. To study the use of Artificial Intelligence and Machine Learning in detecting and preventing

frauds in Indian banks.
2. To identify the challenges and implications of adopting AI-based fraud detection systems in the banking sector.

VII. RESEARCH METHODOLOGY

This study attempts to compare the AI techniques resorted to by public sector banks and private sector banks including new generation banks in India. The information provided by banks through their websites were mainly evaluated. Such valuable insights regarding AI-based fraud detection systems are described herein. Thematic analysis was employed on the qualitative data to spotlight key themes related to the adoption, implementation, and impact of AI in fraud detection within the Indian banking sector.

VIII. RESULTS AND DISCUSSION

Rapid adoption of financial inclusion and digital payments, India's transformation to a digital economy was as fast as the blink of an eye. This sudden evolution also opened up avenues for financial fraud. The entire banking system had to cope up with new and unconventional techniques to combat the challenges posed by such financial frauds. It is in this context that the role of AI in detection and prevention of fraud needs to be evaluated.

RBI, has identified that the mule accounts are the major channels of money laundering and often paves the way for cybercrimes and digital frauds. With a view to curb such financial frauds using mule accounts, The Reserve Bank Innovation Hub has developed an AI tool namely mulehunter.AI. This tool employs advanced algorithms powered by artificial intelligence and machine learning to track mule accounts and detect suspicious activities sufficiently early enabling banks to prevent the potential financial fraud. Besides, the dependence of AI tools RBI has also initiated collaborative efforts with banks to implement its hackathon initiative, named 'Zero Financial Frauds,'

Using technologies like machine learning, generative AI, and intelligent automation across several domains, State Bank of India (SBI) leverages artificial intelligence (AI) to improve risk management, streamline operations, and improve customer experiences. Personalized banking services, AI-driven chatbots like SIA, sophisticated security monitoring, data-driven fraud detection, and projects for digital lending and customer interaction are some of the main uses. Additionally, SBI is investigating domain-specific, self-developed Large Language Models (LLMs) to protect data sovereignty and develop its own core AI capabilities.

In order to better serve its clients and assist them in making informed investment plans, the banking and financial industries are modernizing their technology. Banks are capable of understanding how customers use their products and services and using that information to create more accurate and customer-focused applications, goods, and services. This industry is making significant strides in front-end and back-end AI usage models. The channels branches, online banking, and mobile banking are the front end. These serve as the entry points for clients to receive AI. Over time, these channels are becoming more and better. Without our knowledge, a chatbot on our smartphone can recognize the goods or services we desire, enabling the user to invest, spend, and save money in more intelligent ways. The processes that are being rapidly changed at the back end are process automation, which reduces labour effort and completes work quickly.

All public sector banks in India were directed by Department of Financial Services (DFS) to adopt advanced technologies, including AI/ML solutions, for real-time detection of mule accounts, training & upskilling bank staff on fraud detection and for creating awareness among customers of bank not fall prey to fraudsters. Consequently all public sector banks have started investing in AI and machine learning tools with a view to detect and prevent financial frauds. HDFC Bank, India's largest private-sector lender is in the process of inculcating artificial intelligence into its products, processes, and policies. Real-time risk monitoring, improved internal productivity, and conversational customer experience are the three intended goals of this new generation bank. Machine learning algorithms are used by ICICI Bank, the second- largest private sector bank in India, to identify anomalous transaction patterns and warn any fraudulent activity before it gets out of hand. Over time, AI systems improve the precision and dependability of risk assessments by continuously learning from fresh data. Similar practices are also followed by Axis Bank and other new generation

banks.

IX. SUMMARY AND CONCLUSION

With growing digitalisation in banking sector, the potential of financial frauds and cybercrimes are on the rise. Apart from the conventional systems to curtail fraud and misappropriations, banks in India are on the lookout for advanced technologies revolving around artificial intelligence and machine learning. The Central Bank in India, RBI is co-ordinating efforts to collaborate all banks, whether in public sector or private sector, in developing state of the art technologies that could possibly detect and prevent financial frauds. Taking up the challenge every bank in India is gearing themselves in seeking AI and Machine Learning tools that uses algorithms to detect and prevent frauds and cybercrimes. This is in addition to creating awareness among public not to fall prey to fraudsters.

REFERENCES

[1] Abakarim, Y., Lahby, M., & Attioui, A. (2018). An Efficient Real Time Model For Credit Card Fraud Detection Based On Deep Learning. 1. https://doi.org/10.1145/3289402.3289530 Acevedo-Viloria, J. D., Pérez, S. S., Solano, J., Zarruk-Valencia, D., Paulin, F. G., & Correa

[2] Bahnsen, A. (2021). Feature-Level Fusion of Super-App and Telecommunication Alternative Data Sources for Credit Card Fraud Detection. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2111.03707

[3] Adhikari, P., Hamal, P., & Baidoo, F. (2024). Artificial Intelligence in fraud detection: Revolutionizing financial security. International Journal of Science and Research Ardetectiol 13(1), 1457. https://doi.org/10.30574/ijsra.2024.13.1.1860

[4] Al-Omush, A., Almasarwah, A., & Al-Wreikat, A. (2025). Artificial intelligence in financial auditing: redefining accuracy and transparency in assurance services. EDPACS. 1. https://doi.org/10.1080/07366981.2025.2459490

[5] Angela, O., & Odewuyi, O. M. (2024). Mitigating AI bias in financial decision-making: ADEI perspective. World Journal of Advanced Research and Reviews, 24(3), 1822. https://doi.org/10.30574/wjarr.2024.24.3.3894

[6] Antwi, B. O., Adelakun, B. O., & Eziefule, A. O. (2024). Transforming Financial Reporting with AI: Enhancing Accuracy and Timeliness. International Journal of Advanced Economics, 6(6), 205. https://doi.org/10.51594/ijae.v6i6.1229 Bajpai, A. (2024). Evaluating the Impact of Artificial Intelligence on Enhancing Tax Compliance and Financial Regulation. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4922459

[7] Bello, O. A., & Olufemi, K. (2024). Artificial intelligence in fraud prevention: Exploring techniques and applications challenges and opportunities. Computer Science & IT Research Journal, 5(6), 1505. https://doi.org/10.51594/csitrj.v5i6.1252

[8] Bình, N. T. T. (2025). Transforming Auditing in the AI Era: A Comprehensive Review [Review of Transforming Auditing in the AI Era: A Comprehensive Review]. Information, 16(5), 400. Multidisciplinary Digital Publishing Institute. https://doi.org/10.3390/info16050400

[9] Buchanan, B. (2019). Artificial intelligence in finance. In Zenodo (CERN European Organization for Nuclear Research). European Organization for Nuclear Research. https://doi.org/10.5281/zenodo.2612537

[10] Ebbage, A. (2018). Banking on artificial intelligence. Engineering & Technology, 13(10), 66. https://doi.org/10.1049/et.2018.1008 Garcia-Segura, L. A. (2024). The Role of Artificial Intelligence in Preventing Corporate Crime. Journal of Economic Criminology, 5, 100091. https://doi.org/10.1016/j.jeconc.2024.100091

[11] Jain, V., Balakrishnan, A. V., Beeram, D., Najana, M., & Chintale, P. (2024). Leveraging Artificial Intelligence for Enhancing Regulatory Compliance in the Financial Sector. International Journal of Computer Trends and Technology, 72(5), 124. https://doi.org/10.14445/22312803/ijctt-v72i5p116

[12] Kalyanakrishnan, S., Panicker, R., Natarajan, S., & Rao, S. (2018). Opportunities and Challenges for Artificial Intelligence in India. 164. https://doi.org/10.1145/3278721.3278738

[13] Kumar, A. (2024). Redefining Finance: The Influence of Artificial Intelligence (AI) and

Machine Learning (ML). arXiv. https://doi.org/10.48550/ARXIV.2410.15951

[14] Kurshan, E., Mehta, D., Bruss, B., & Balch, T. (2024). AI versus AI in Financial Crimes and Detection: GenAI Crime Waves to Co-Evolutionary AI. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2410.09066

[15] Kushwah, L. S. (2025). Enhancing Payment Ecosystems with AI/ML: Real-Time Analytics for Fraud Prevention and User Insights. World Journal of Advanced Research and Reviews, 26(1), 2124. https://doi.org/10.30574/wjarr.2025.26.1.1273

[16] Majumder, R. Q. (2025). A Review of Anomaly Identification in Finance Frauds Using Machine Learning Systems [Review of A Review of Anomaly Identification in Finance Frauds Using Machine Learning Systems]. International Journal of Advanced Research in Science Communication and Technology, 101. Shivkrupa Publication's. https://doi.org/10.48175/ijarsct-25619

[17] Malik, A. C. P. (2024). Credit Risk Assessment and Fraud Detection in Financial Transactions Using Machine Learning. Deleted Journal, 20, 2061. https://doi.org/10.52783/jes.1807

[18] Mallesha, C. (2019). Impact of Artificial Intelligence on Banking Sector in India. International Journal for Research in Applied Science and Engineering Technology, 7(10) Cornelll https://doi.org/10.22214/ijraset.2019.10077

[19] Mhlanga, D. (2020). Industry 4.0 in Finance: The Impact of Artificial Intelligence (AI) on Digital Financial Inclusion. International Journal of Financial Studies, 8(3), 45. https://doi.org/10.3390/ijfs8030045

[20] Mytnyk, B., Tkachyk, O., Shakhovska, N., Федушко, С., & Syerov, Y. (2023). Application of Artificial Intelligence for Fraudulent Banking Operations Recognition. Big Data and Cognitive Computing, 7(2), 93. https://doi.org/10.3390/bdcc7020093

[21] Odufisan, O. I., Abhulimen, O. V., & Ogunti, E. (2025). Harnessing Artificial Intelligence and Machine Learning for Fraud Detection and Prevention in Nigeria. Journal of Economic Criminology, 100127. https://doi.org/10.1016/j.jeconc.2025.100127

[22] Omokanye, A. O., Ajayi, A. A., Olowu, O., Adeleye, A. O., Chianumba, E. C., & Omole, O. M. (2024). AI-powered financial crime prevention with cybersecurity, IT, and data science in modern banking. International Journal of Science and Research Archive, 13(2), 570.

[23] https://doi.org/10.30574/ijsra.2024.13.2.2143

[24] Pan, E. (2024). Machine Learning in Financial Transaction Fraud Detection and Prevention. Transactions on Economics Business and Management Research, 5, 243. https://doi.org/10.62051/16r3aa10

[25] Pasam, T. P. (2023). Leveraging AI for Fraud Detection and Prevention in Insurance Claims. International Journal of Enhanced Research in Science Technology & Engineering, 12(11), 118. https://doi.org/10.55948/ijerste.2023.1116

[26] Patil, D. (2025a). Artificial Intelligence in Financial Risk Assessment and Fraud Detection: Opportunities and Ethical Concerns. https://doi.org/10.2139/ssrn.5057434

[27] Patil, D. (2025b). Artificial Intelligence In Financial Services: Advancements In Fraud Detection, Risk Management, And Algorithmic Trading Optimization. https://doi.org/10.2139/ssrn.5057412

[28] Paul, A. A., & Ogburie, C. P. (2025). The Role of AI in preventing financial fraud and Enhancing compliance. GSC Advanced Research and Reviews, 22(3), 269.

[29] https://doi.org/10.30574/gscarr.2025.22.3.0086 Raju, R. (2025). From Models to Markets: Generative AI and Its Emerging Role in Indian Financial Services. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.5223947

[30] Rouhollahi, Z. (2021). Towards Artificial Intelligence Enabled Financial Crime Detection. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2105.10866

[31] Ryman-Tubb, N., Krause, P., & Garn, W. (2018). How Artificial Intelligence and machine learning research impacts payment card fraud detection: A survey and industry benchmark. Engineering Applications of Artificial Intelligence, 76, 130. https://doi.org/10.1016/j.engappai.2018.07.008

[32] Sari, Y., & Indrabudiman, A. (2024). The Role of Artificial Intelligence (AI) in Financial Risk Management. Formosa Journal of Sustainable

Research, 3(9), 2073. https://doi.org/10.55927/fjsr.v3i9.11436

[33] Showalter, S., & Wu, Z. (2019). Minimizing the Societal Cost of Credit Card Fraud with Limited and Imbalanced Data. arXiv (Cornell University). https://doi.org/10.48550/arxiv.1909.01486

[34] Sowmya, G. S., & Sathisha, H. K. (2023). Detecting Financial Fraud in the Digital Age: The AI and ML Revolution. International Journal For Multidisciplinary Research, 5(5). https://doi.org/10.36948/ijfmr.2023.v05i05.6139

[35] Uchhana, N., Ranjan, R., Sharma, S., Agrawal, D., & Punde, A. (2021). Literature Review of Different Machine Learning Algorithms for Credit Card Fraud Detection. International

[36] Journal of Innovative Technology and Exploring Engineering, 10(6), 101. https://doi.org/10.35940/ijitee.c8400.0410621

[37] Vijai, C. (2019). Artificial Intelligence in Indian Banking Sector: Challenges And Opportunities. International Journal of Advanced Research, 7(4), 1581. https://doi.org/10.21474/ijar01/8987

[38] Xia, Z., & Saha, S. C. (2025). FinGraphFL: Financial Graph-Based Federated Learning for Enhanced Credit Card Fraud Detection. Mathematics, 13(9), 1396. https://doi.org/10.3390/math13091396

[39] Xu, H., Niu, K., Lu, T., & Li, S. (2024). Leveraging artificial intelligence for enhanced risk management in financial services: Current applications and future prospects. Engineering Science & Technology Journal, 5(8), 2402. https://doi.org/10.51594/estj.v5i8.1363

[40] Yazıcı, Y. (2020). Approaches to Fraud Detection on Credit Card Transactions using Artificial Intelligence Methods. 235. https://doi.org/10.5121/csit.2020.101018