

RESEARCH ARTICLE

## ARTIFICIAL INTELLIGENCE IN BANKING: SHAPING NEW PATHS FOR FINANCIAL INCLUSION IN INDIA

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**Abstract:** Artificial intelligence (AI) is making it much easier for more people to have access to banking services and also enhancing financial inclusion especially in countries like India. AI is changing how banks do things in three main ways: how they work, what they offer, and how customers and employees experience banking as well as financial services. This article looks at how artificial intelligence (AI) can be used to provide personalized, effective, and conveniently accessible financial services and promoting financial inclusion in India. By eliminating traditional barriers like geographic limitations, a lack of credit history, and resource-intensive operations, artificial intelligence is enabling banks to reach underbanked and unbanked areas. The paper highlights various examples from the Indian banking industry while addressing challenges like infrastructural constraints and data privacy concerns in order to maximize AI's potential for fostering equitable growth and increasing financial inclusion. This research will investigate the current state of AI adoption within the Indian banking sector, analysing recent trends, opportunities, and challenges in enhancing financial inclusion in India. The study will also conduct comparative analyses with international banking practices and identify potential AI-driven advancements yet to be realized in India.

**Keywords:** Artificial Intelligence, Financial Inclusion, Indian Banking Sector, AI-Driven Financial Services, AI-Powered Finance.

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### INTRODUCTION

In the past ten years, digital technology and Artificial Intelligence have completely transformed how Indian banking functions and its penetration. Demonetization in 2016 and the government's push for digital technology forced banks to modernize and better serve a population that increasingly relies on digital tools.

Artificial intelligence (AI), a game-changer, is helping banks enhance security, streamline operations, improve customer service, and personalize offers. By 2025, it is anticipated that India's AI market will have grown to \$7.8 billion, with the banking sector accounting for a sizable portion of this expenditure. However, when it comes to the broad use of cutting-edge AI technologies in banking, India continues to lag behind nations like the US and the UK.

While many Indian banks have integrated AI into their operations, there are numerous AI technologies that remain untapped. According to the research, 78% of financial institutions either already have plans to use Gen AI in their operations or want to do so. Sixty-one percent of this market is ready for major change so that generative AI (Gen AI) may achieve unprecedented levels of efficiency and responsiveness.

Chatbots and virtual assistants, which communicate directly with customers, will be adopted as early as mid-2023. Currently, this technology is used by 15 out of 21 public sector banks and 11 out of 12 public sector banks. The Indian banking industry, which has the highest AI growth index, is renowned for being an early adopter of AI.

Accordingly, by 2023, AI applications are predicted to save potential expenses by \$447 billion. This move to Gen AI is altering the banking industry's business environment in an effort to create a more efficient and innovative future.

Highlighting the financial sector's dramatic shift to a forward-thinking, tech-savvy strategy is crucial at this time. The following figure talks about the various cases where generative AI is used in banking sector.

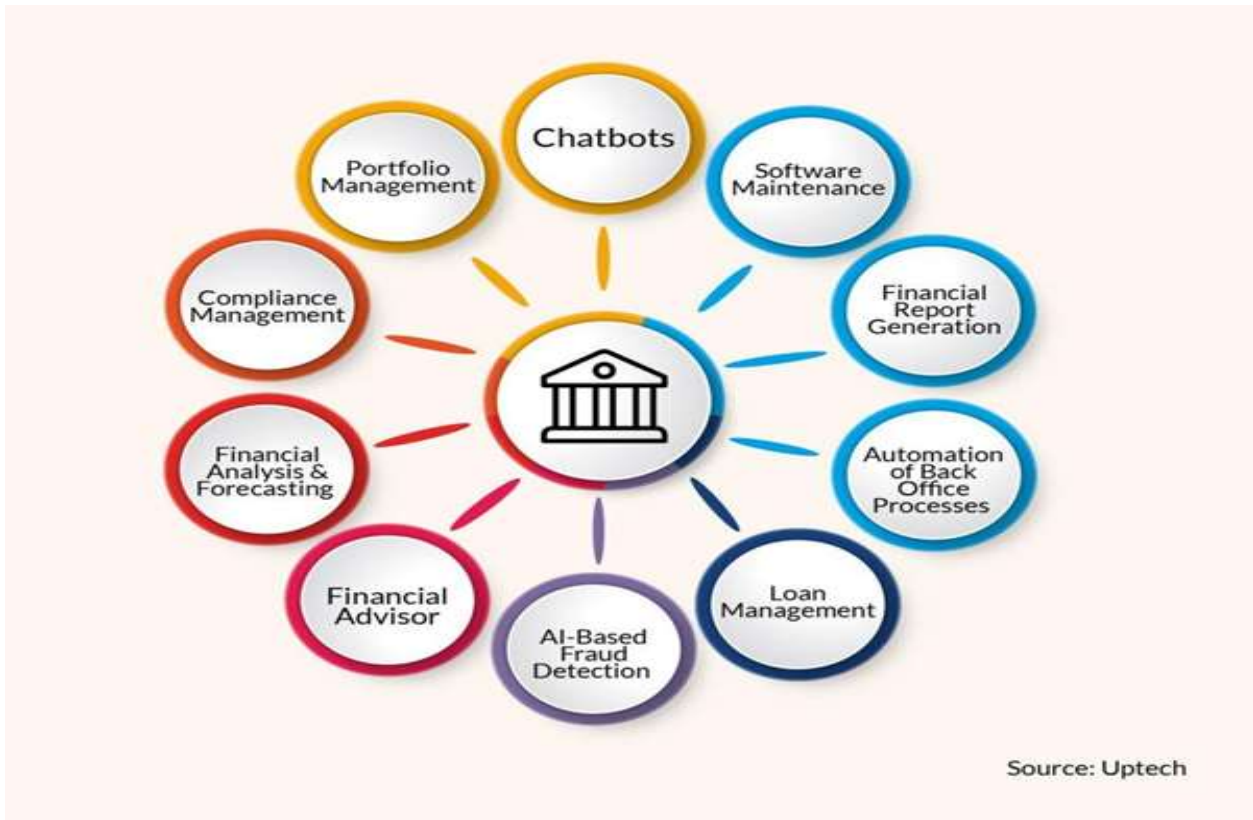


Fig.1: Use cases of generative AI in banking sector

## RESEARCH METHODOLOGY

Using secondary data and a descriptive research methodology, the study will examine how artificial intelligence (AI) might enhance financial inclusion in the Indian banking industry. Numerous reliable sources, including government publications, industry analysis, academic research, and bank reports, will be used to collect secondary data.

The focus of the study will be on key AI technologies like chatbots, machine learning, predictive analytics, and biometric authentication. It will examine how these technologies affect the affordability, accessibility, and efficiency of financial services, especially in rural areas.

Content and comparative analysis will be used to identify patterns and gauge how well AI is being implemented across banks. This approach aims to give a comprehensive grasp of how AI might enhance financial inclusion in India, while also acknowledging

limitations like generalization and data availability.

The **specific objectives** of this study are:

- To examine the present developments and trends of AI usage in Indian banks.
- To investigate the main difficulties of Indian banks in the implementation of AI.
- To compare AI adoption in Indian banking with the global banking system.
- To investigate the opportunities in implementing AI in Indian banks.
- To analyse how AI applications can develop financial inclusion in India.

## REVIEW OF LITERATURE

The increasing demand for efficiency, enhanced customer experiences, and cost reduction has led to a substantial worldwide expansion in the use of artificial intelligence (AI) in the banking sector.

By enabling banks to offer more affordable, accessible services, and individualized, especially to those from disadvantaged backgrounds, artificial intelligence (AI) technologies have contributed considerably to the growth of financial inclusion in recent years. Globally, artificial intelligence (AI) has been utilized to close gaps in the financial services sector, especially for people who are excluded from traditional banking due to factors including low income, no credit history, or regional constraints. Numerous studies show how machine learning algorithms can improve credit scores and assist banks in assessing the creditworthiness of individuals without formal credit histories. To make credit scoring more inclusive and representative of a larger range of consumers, research by Binns *et. al.* (2020) and Berkowitz *et al.* (2021) demonstrates how AI-powered models have revolutionized credit scoring by leveraging alternative data such as utility payments, social behavior, and mobile phone usage.

AI-powered chatbots and virtual assistants have also become essential tools for improving customer service. According to KPMG (2021), financial institutions worldwide are increasingly using AI-based chatbots to automate customer interactions, offer 24/7 assistance, respond to inquiries, and offer financial advice. In remote and rural areas where there might not be many opportunities for human interaction, this is quite beneficial. A wider range of people may now access financial services more easily thanks to the application of predictive analytics in decision-making processes including risk management, fraud detection, and personalized product offerings.

Additionally, biometric authentication-such as facial recognition and fingerprint scanning-has grown in popularity as a secure and useful method of identity verification in banking, particularly in places with a shortage of traditional banking infrastructure. Arora *et. al.* (2020), in their study on the significance of biometric technologies in financial inclusion, look at how these technologies enhance security while facilitating access to financial services for those with limited literacy or documentation. AI has a lot of potential to advance financial inclusion, even though its application in banking is still relatively new

in India. The Indian government's Digital India and Pradhan Mantri Jan Dhan Yojana (PMJDY) programs have cleared the path for the widespread application of AI, particularly in rural regions. A report by Sahoo (2021) claims that Indian banks are utilizing artificial intelligence (AI) tools like machine learning and natural language processing to offer financial products that are tailored to the requirements of underserved customers. For instance, companies such as RBL Bank and Bajaj FinServ are lending money to individuals without a formal credit history by employing AI-based credit assessment models. AI-powered chatbots, such as HDFC Bank's EVA and ICICI Bank's iPal, are being used by Indian customers more frequently to access banking services through mobile apps. These chatbots are capable of completing transactions, responding to inquiries, and offering customized financial advice. According to Rath (2020), these digital assistants are crucial for improving financial literacy, especially in rural areas where access to traditional banking services is limited.

Predictive analytics is also used by Indian banks for targeted marketing, loan approval, and risk assessment. Indian banks have effectively used predictive analytics to spot trends in customer behavior, enabling the delivery of more personalized products and services (Das *et al.*, 2020). The article by Patranobis and Gopal (2017) titled "Mitra and Candi: The Robots Who Take Care of Customers at Canara Bank in Bengaluru" discusses how the deployment of humanoid robots enhances customer service and promotes digitization in Bengaluru branches of the bank.

Shetty (2017) explores the implementation of AI in the Indian banking sector, with a focus on Bengaluru, highlighting its benefits such as improved customer experience, operational efficiency, and reduced risks. The study emphasizes addressing challenges like trust, privacy, and security to fully leverage AI's potential in banking. Rawal (2017) highlights how ICICI Bank leverages AI to enhance customer service through features like handling general queries, bill payments, fund transfers, and mobile recharges. The article underscores the bank's commitment to integrating advanced technology for streamlining operations and improving user experience.

## RESEARCH GAPS

Many studies have been conducted on the introduction of AI in the banking industry globally, but very fewer studies have been done about how AI impacts financial inclusion in India. Most study focuses on urban settings because AI adoption is more prevalent there, with less attention paid to how AI impacts rural communities. Additionally, a significant amount of recent research focuses on individual AI technologies, like chatbots or machine learning, without delving deeply into how these technologies may collaborate to create a comprehensive financial inclusion strategy. This gap offers the opportunity to explore how integrating different AI technologies could offer a successful strategy for financial inclusion in India.

### • Present Status of AI Adoption in Indian Banks

**AI-powered chatbots and Virtual Assistants:** One of the most well-known applications of AI in Indian banks is the use of chatbots and virtual assistants to enhance customer service. Thanks to this technology,

banks can now provide round-the-clock assistance, respond to consumer requests more quickly, and reduce the strain on human agents. One of the largest private sector banks in India, HDFC Bank, unveiled Eva, an AI-powered chatbot, in 2017.

Eva can handle millions of questions across multiple platforms, including websites and mobile apps. In its first six months of operation, Eva had responded to over 3 million customer requests. In a similar vein, ICICI Bank introduced iPal, a virtual assistant that has significantly improved customer satisfaction and can manage more than 250 different types of banking transactions.

The largest public sector bank in the country, State Bank of India (SBI), has also joined the competition with SIA (SBI Intelligent Assistant). SIA was established to assist customers with frequent questions and provide seamless services across digital platforms. By 2022, SIA had served over 20 million customers, saving the bank millions in operational costs.

**Table 1: Present status of AI adoption in Indian banks**

S.No.	Name of the Banks	AI ChatBot / virtual assistants	Year of implementation	Ways to connect
1	City Union Bank	CUB Lakshmi Robot	2016	Bank’s Website, Facebook
2	Yes Bank	Yes Robot	2016	Bank’s Website, Facebook Messenger
3	HDFC Bank	Eva	2017	Bank’s Website, Google Assistant, Amazon Alexa
4	ICICI Bank	iPal	2017	Bank’s Website, Mobile Bank
5	SBI	SIA	2017	Bank’s Website
6	Union Bank of India	UVA	2017	Bank’s Website
7	Canara Bank	Mitra and Candi Robot	2017	At Bank Premises
8	Kotak Mahindra Bank	Keya	2018	Bank’s Website
9	IndusInd Bank	Indus Assist	2018	Bank’s Website, Alexa
10	Axis Bank	Axis Aha	2018	Bank’s Website, Axis Mobile App
11	Andhra Bank	ABHi	2019	Bank’s Website

Source: Website

**Table 2: Services offered through AI in Indian banks**

S.No	Name of the Bank	Services offered by AI Chatbot / Virtual Assistants	Source
1	ICICI Bank	All general queries, bill pay, fund transfer, recharge	Rawal (2017)
2	SBI	All general queries	Shetty (2017)
3	Canara Bank	Robot, Works similarly to the bank employee	Patranobis and Gopal (2017)
4	Andhra Bank	All general queries, balance checks, mini statements	UNI (2019)

5	HDFC Bank	All general queries except payments	Website
6	Yes Bank	Check Balance, recent transactions, send money, Recharge phone, pay bills, FD/RD, check loan eligibility	Website
7	IndusInd Bank	General queries, Account Balance, Transfer Funds, Credit card bills	Website
8	Kotak Mahindra Bank	General queries, fund transfers, fixed deposits	Website
9	Axis Bank	General queries, Cheques book request, block card, bill payment, recharge, fund transfer, manage limits on cards	Website
10	City Union Bank	General queries, Almost all services	Website
11	BOB	All general queries	Website
12	Union Bank of India	All general queries	Website

Source: Website

## AI in Fraud Detection and Risk Management

Fraud detection and prevention is one crucial area where AI has made a big difference. As digital banking and online transactions have increased, Indian banks are increasingly relying on artificial intelligence (AI) to analyze massive amounts of data and identify fraudulent activities in real-time.

ICICI Bank is a leader in this area and uses artificial intelligence (AI) to spot suspicious transactions before they turn into major fraud. The bank's AI-powered fraud detection algorithms scan 15 million transactions per day, identify unusual patterns, and promptly notify the risk management team. This has led to a 25% reduction in the bank's fraud losses over the last three years.

Axis Bank has demonstrated its usage of AI for fraud prevention by developing machine learning algorithms that have resulted in a 20% decrease in fraud incidences. By monitoring transactions via many channels, such as ATMs and mobile banking, Axis Bank's technology guarantees a thorough approach to security.

## AI-Driven Credit Scoring and Lending

Some of the most innovative uses of AI in Indian banking have been in credit rating and lending. Artificial intelligence (AI) has changed how traditional credit scoring methods often exclude people without a significant credit history by enabling banks to assess creditworthiness using alternative data sources, such as spending patterns, income patterns, and even social media activity.

Both HDFC Bank and ICICI Bank have accelerated their loan approval processes through the usage of AI. ICICI Bank's AI-driven credit scoring algorithms have resulted in a 60 % reduction in loan approval timeframes and a 30 % rise in loan recovery rates due to enhanced risk assessments. Similarly, HDFC Bank uses AI to immediately assess loan applications, which helps those better serve new-to-credit customers.

Yes Bank, another major player in the Indian banking industry, has used AI to automate its loan disbursement processes. The bank uses AI to process loan applications faster, which lowers the default rate. Yes Bank's AI-based underwriting technology helped to boost loan approval rates by 35%, especially in the MSME (Micro, Small & Medium Enterprises) sector.

## Personalized Banking with AI

Personalization is a key component of modern banking, and AI is helping Indian banks tailor their products to the unique needs of each customer. Thanks to artificial intelligence (AI) analysis of customer data, banks may now offer tailored recommendations, products, and services based on customer preferences and financial behaviour.

For example, SBI uses AI to evaluate consumer spending patterns and offer tailored financial advice. The bank's AI-powered solutions help customers manage their money more effectively by offering customized loans based on credit behaviour, recommending potential investments, and exchanging expenditure data.

Additionally, Kotak Mahindra Bank has been using AI to provide customized financial services. After analyzing transaction data, the bank's AI engine sends out original notifications to customers about upcoming bill payments, investment opportunities, and special promotions. This not only improves customer satisfaction but also facilitates cross-selling for the bank.

**• Challenges in the Adoption of AI for Indian Banks**

Even while Indian banks have adopted AI at a rapid pace, several obstacles have kept widespread integration from happening, particularly when compared to banks in developed economies.

**Legacy Systems:** One of the main issues facing Indian banks, particularly public sector banks, is the use of outdated legacy technology. Because these technologies are difficult to combine with modern AI platforms, banks are unable to fully realize the potential of AI. Many banks are now upgrading their IT infrastructure, but this is a costly and time-consuming process.

**Data Privacy and Security Concerns:** Since AI is mostly dependent on data, banks are now required to handle customer data with greater caution due to India's Personal Data Protection Bill. Concerns about data security and privacy are growing, especially as cyber threats rise. Banks must ensure that

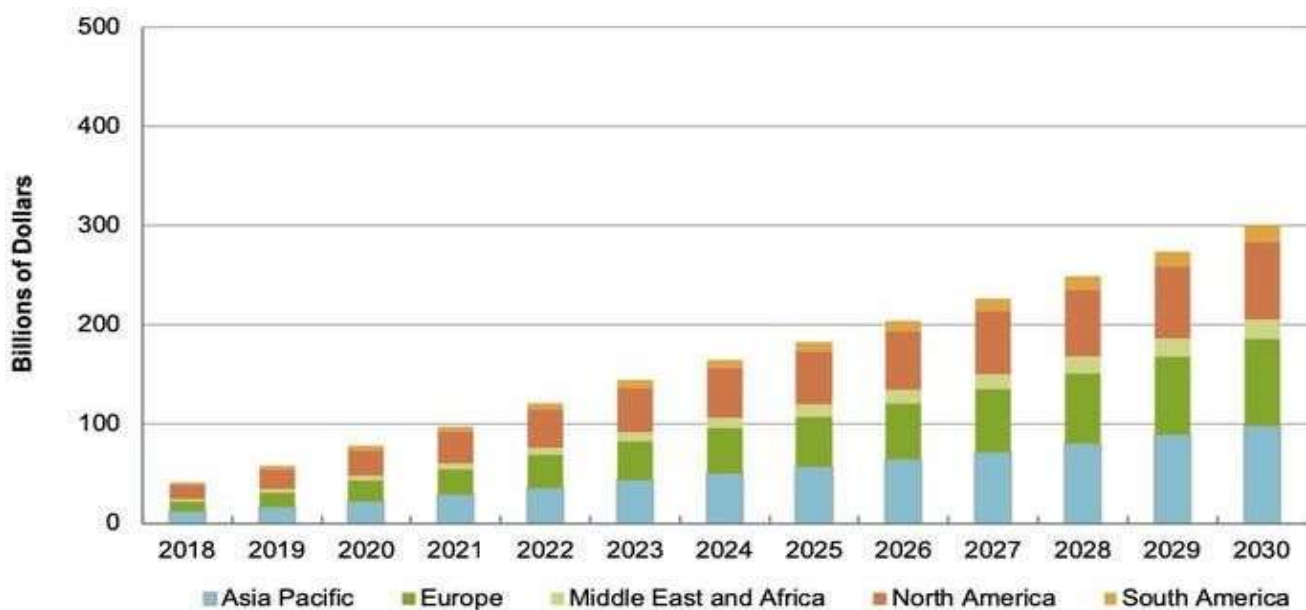
their AI systems comply with the new regulations, which further complicates matters.

**Talent Shortage:** The Indian banking industry has a glaring lack of AI experience. Private banks can afford to invest in AI expertise, but many smaller banks find it difficult to find and hire AI and machine learning experts. One of the main obstacles to scaling AI use throughout the financial industry is the lack of talent.

**• Application of AI in Indian Banking vs. Global Banking System**

According to the Artificial Intelligence in Banking Report, the greatest market for AI in banking is expected to be North America from 2018 to 2023. By 2030, the region's AI business will be worth close to \$79 billion, up from \$14.7 billion in 2018. However, as APAC and EMEA areas increase their installations, North America's proportional importance is expected to decrease between 2024 and 2030.

The second-most important region for AI in banking is now Asia Pacific. By 2024, the market, which was valued at \$11.5 billion in 2018, is expected to reach \$50.6 billion, positioning the area as the global leader in banking AI. Don Tait said "Countries like China, Japan, South Korea, Hong Kong, and Singapore are likely to drive the demand for AI within the banking sector over the next ten years,".



**Fig. 2: Global AI banking business value by region**

Source: HIS Markit

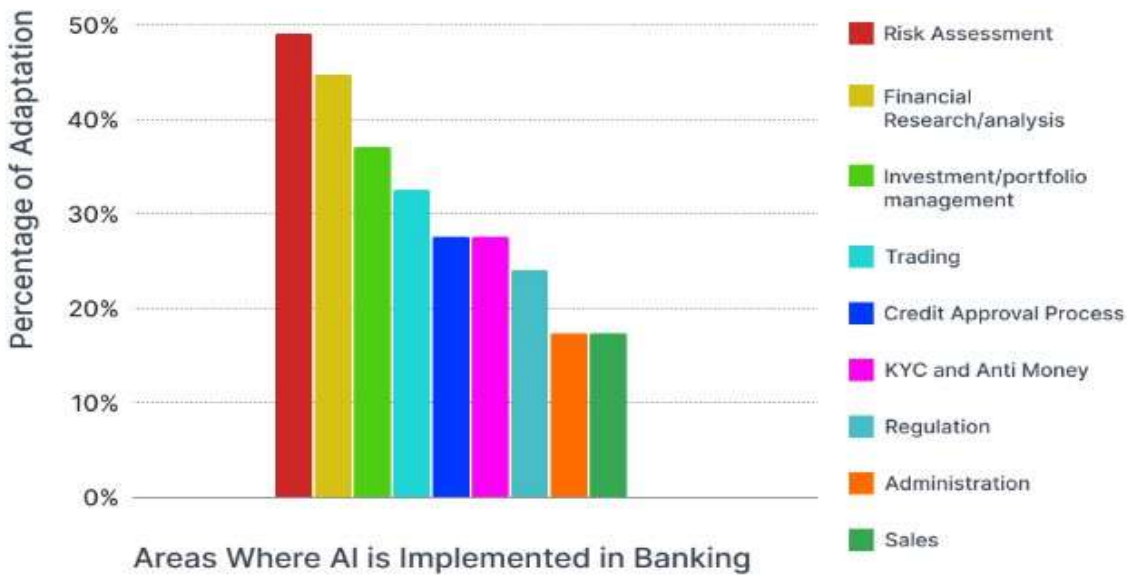


Fig. 3: AI applications in U.S. banking

Source: Appventurez, 2024

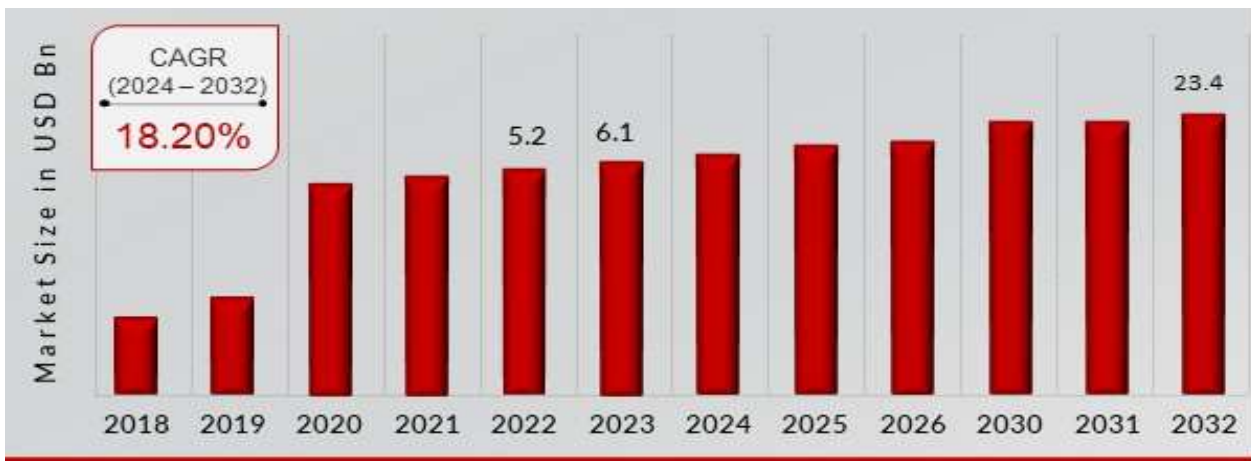


Fig. 4: AI Market overview: India

Source: Market research future database and analysis, 2024

The aforementioned data indicates that Indian banks have a great deal of room to apply AI in a variety of fields. The compound annual growth rate (CAGR) of AI implementation in the Indian market is 18.20%. Even while Indian banks have embraced AI in several ways, many cutting-edge AI technologies that are standard in foreign banks have not yet been extensively adopted in India. Here are a few cases where Indian banks have opportunities for AI implementation.

**• Opportunities for AI implementation in Indian Banks**

**AI-Driven Wealth Management Platforms:** Banks in the US and Europe, including JPMorgan Chase and Goldman Sachs, are utilizing AI to offer wealth management robo-advisory services. These platforms help investors better manage their portfolios by providing automated, algorithm-driven financial advice. Only a few banks in

India are experimenting with robo-advisory services, which are still in their infancy.

**Predictive Analytics for Proactive Customer Engagement:** International banks like Wells Fargo anticipate client demands and provide answers before issues develop by utilizing AI-powered predictive analytics. In comparison to international markets, predictive analytics is still underutilized, notwithstanding certain advancements made by Indian banks in this field. Banks can improve customer satisfaction, boost loyalty, and provide more individualized experiences by actively engaging with their customers.

**AI-Driven Algorithmic Trading:** Algorithmic trading, which uses AI to execute deals at the ideal moments, is widely employed in countries like the US, the UK, and Japan. Nevertheless, algorithmic trading has not yet been adopted by Indian banks to

the same degree as it is in other markets. Even though businesses like HDFC Securities and numerous others are experimenting with AI in trading, the market is still growing.

**AI for Regulatory Compliance (RegTech):** International banks are finding it simpler to comply with complex regulatory regimes thanks to RegTech solutions driven by AI. HSBC and UBS are two examples of companies that utilize AI to automate reporting processes, reduce regulatory risks, and keep an eye on compliance. In Indian banks, RegTech is barely getting started because the majority of compliance processes still require manual labour.

• **Improving Financial Inclusion with Innovative Ideas in AI-Powered Banking**

Artificial intelligence (AI)-driven banking technologies can fundamentally transform financial inclusion by filling up accessibility gaps to banking services. Using state-of-the-art technologies, banks may offer tailored solutions to meet a variety of financial needs, optimize operations, and reach underserved populations. These are some ways that integrating AI into banking systems can promote financial inclusion.

**AI-Powered Financial Tools for Rural Access:** Rural residents now have easier access to financial services because of AI-driven technologies like chatbots and virtual assistants, which provide reasonably priced, round-the-clock banking services. These technologies help bridge the geographic gap and ensure that consumers who are not near physical bank branches may nevertheless connect to banking systems by offering personalized experiences in regional languages. Thanks to smartphone banking, underserved groups can now access financial services considerably more easily. Therefore, by enabling even remote places to access essential services, AI is playing a critical role in democratizing banking.

**Alternative Credit Scoring for Financial Inclusion:** By assessing the reliability of credit using non-traditional data, such as payment history and smartphone usage patterns, artificial intelligence (AI) is revolutionizing credit scoring and opening up financial access to those without formal credit records. This is extremely beneficial in

India, where a large portion of the population lacks or has insufficient banking. Financial institutions can now evaluate alternative data and lend money to those who wouldn't otherwise be able to use the banking system thanks to artificial intelligence. This innovation in credit scoring promotes diversity while assisting historically marginalized groups in creating their financial identities.

**Personalized Financial Solutions:** Banks can now develop financial products that are tailored to the needs of underrepresented and low-income groups thanks to artificial intelligence. By employing artificial intelligence (AI) to analyze client behavior and preferences, banks can offer customized solutions, such as microloans or savings programs, that suit each customer's financial circumstances. Customers are more financially engaged and equipped to make prudent financial decisions thanks to these tailored offerings. By satisfying their specific needs, AI increases customer happiness and motivates underprivileged groups to use formal financial services.

**Cost Reduction and Scalability of Services:** AI makes it more profitable for banks to provide services to customers with lower incomes and those who reside in remote areas by reducing operating costs. By automating processes that would otherwise require physical infrastructure and human involvement, artificial intelligence (AI) enables banks to offer more affordable services. The scalability of AI-driven solutions allows financial services to be swiftly expanded to large populations without requiring significant additional costs. This cost-effectiveness not only encourages financial inclusion but also enables sustainable growth for Indian financial institutions.

**Fraud Prevention and Trust Building:** By identifying and removing fraud instantly, artificial intelligence (AI) enhances the security of financial transactions, which is essential for boosting confidence in online banking systems. To protect vulnerable people from financial fraud, banks can use sophisticated machine learning algorithms to analyse enormous amounts of transactional data and identify questionable activities. AI provides a sense of security and reliability to underserved individuals who are reluctant to



use traditional banking because of security worries. More banking services are used as a result of this enhanced security architecture, which increases financial inclusion across India. The aforementioned criteria illustrate significant areas where AI can support financial inclusion, even though there are other strategies. Banks must investigate and implement these additional strategies to increase financial accessibility.

## CONCLUSION

Artificial intelligence has changed the Indian banking sector by enhancing fraud detection and credit rating in improving customer experience through chatbots. Despite their notable developments, Indian banks still have a long way to go before they can compete with their global competitors. Reaching AI's full potential in India's financial sector would require overcoming obstacles like data privacy concerns, antiquated systems, and staff shortages. The potential of artificial intelligence (AI) in Indian banking is bright, but it will require consistent creativity, investment, and cooperation to guarantee that all players—large and small—can fully utilize AI.

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