

Artificial Intelligence in Credit Scoring and Loan Underwriting: An Indian Perspective

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ABSTRACT

Artificial Intelligence (AI) is transforming credit scoring and loan underwriting in India. Traditional methods mainly rely on credit history and income data, which can restrict credit access for many individuals and small businesses. AI systems leverage advanced data analysis and machine learning to assess borrower risk more accurately and rapidly, utilizing both conventional and alternative data sources. This article discusses how AI-driven credit scoring and loan underwriting are implemented in India's financial sector. It emphasizes benefits like faster loan approvals, better risk assessment, and greater financial inclusion. It also covers challenges such as data privacy, algorithmic bias, lack of transparency, and regulatory issues. Overall, the findings suggest that AI has significant potential to enhance lending efficiency and inclusion in India, provided it is used responsibly and complies with regulatory standards.

Keywords: Artificial Intelligence, Credit Scoring, Loan Underwriting, Financial Inclusion, India

INTRODUCTION

Credit scoring and loan underwriting are vital in India's financial ecosystem, especially for determining access to credit for individuals, small businesses, and MSMEs. Traditionally, India has relied on formal income proof, collateral, and credit bureau data for credit assessments. This approach often excludes a significant portion of the population working in the informal and semi-formal sectors. While conventional statistical models used in credit assessment are structured and accepted by regulators, they frequently do not fully reflect the diverse and changing financial behaviors of Indian borrowers (Altman & Saunders, 1998).

India's rapid digital transformation has greatly changed the lending environment. The growth of digital payments, fintech platforms, and mobile financial services has created large volumes of borrower data beyond traditional credit histories. Efforts to enhance financial inclusion and the increasing reach of digital lending have heightened the demand for quicker, more precise, and scalable credit evaluation methods (World Bank, 2023). In this setting, Artificial Intelligence (AI) has become a crucial tool for modernizing credit scoring and loan approval processes in India.

AI-based credit scoring systems use machine learning and advanced analytics to analyze both traditional financial data and alternative sources like transaction histories, digital payment patterns, and behavioral indicators. These systems are especially important in India, where many borrowers are classified as thin-file or no-file customers. Recent research shows that AI-driven credit models outperform traditional methods in predicting defaults and expanding credit access in emerging markets, including India (Bussmann et al., 2023; Machado, 2025). The adoption of AI in loan underwriting has also revolutionized operations in Indian banks, non-banking financial companies (NBFCs), and fintech lenders. Automated systems provide real-time risk assessments, minimize manual work, and greatly reduce loan approval times. This efficiency is vital in high-volume retail lending and MSME financing, where rapid processing and cost savings are key to staying competitive (Deloitte, 2024).

From a regulatory standpoint, the Reserve Bank of India has increasingly focused on AI's role in lending, highlighting the importance of responsible innovation, data privacy, and fairness in digital lending.

Transparency, accountability, and consumer protection are now essential elements in deploying AI-based credit systems within India's financial industry. Overall, AI-driven credit scoring and loan approval processes mark a major transformation in India's lending landscape. They improve predictive accuracy, streamline operations, and promote financial inclusion, supporting sustainable credit growth. Nonetheless, successful implementation depends on meeting regulatory standards, upholding ethical principles, and considering India's unique socio-economic context.

Objectives of the Study

The present study aims to:

1. To examine the application of Artificial Intelligence in credit scoring and loan underwriting within the Indian financial system.
2. To analyse the benefits and challenges associated with AI-powered credit assessment in India.
3. To review the regulatory, ethical considerations and future trends of AI-driven lending practices in India.

Scope of the Study

The scope of the study is confined to the application of Artificial Intelligence in credit scoring and loan underwriting within the Indian financial system. The study focuses on banks, NBFCs, and fintech lending platforms operating in India. It covers AI-based credit assessment practices used in retail and MSME lending, along with associated benefits, challenges, and regulatory aspects. The study is conceptual in nature and is based on secondary data sources.

RESEARCH METHODOLOGY

The present study adopts a conceptual and descriptive research design to examine the role of Artificial Intelligence in credit scoring and loan underwriting within the Indian financial system. The study relies entirely on secondary data and does not involve primary data collection or empirical analysis. Relevant information has been gathered from peer-reviewed academic journals, books, policy documents, and research reports on artificial intelligence, credit risk management, and digital lending. In addition, regulatory publications and guidelines issued by the Reserve Bank of India, along with reports from international institutions such as the World Bank, have been reviewed to understand the regulatory and ethical dimensions of AI-based lending in India.

The collected literature was systematically reviewed and qualitatively analysed to identify key themes related to AI models, credit assessment frameworks, benefits, challenges, and future trends. A narrative synthesis approach was used to integrate findings from diverse sources and develop a comprehensive understanding of AI-powered credit scoring and loan underwriting practices in the Indian context. The study emphasizes conceptual clarity and contextual relevance, ensuring alignment with India's socio-economic conditions and evolving digital lending landscape.

Framework of AI-Powered Credit Scoring and Loan Underwriting in India

The structure of AI-powered credit scoring and loan underwriting in India is influenced by the country's distinctive financial ecosystem, which features a large informal sector, varied borrower profiles, and swift digital adoption. Unlike traditional methods that rely mainly on formal income documents and credit bureau scores, India's AI-based systems incorporate multiple data sources and sophisticated analytics to develop more detailed borrower risk profiles (Bussmann et al., 2023). At its core, this approach involves collecting data from both conventional sources, such as credit bureau reports, bank statements, and repayment records, and alternative sources like digital payment transactions, mobile usage patterns, and platform-based financial activities. This diverse data integration is especially important in India, where many borrowers lack extensive formal credit histories but are active within digital financial ecosystems (World Bank, 2023).

The framework's analytical layer uses machine learning to analyze borrower data, spotting patterns, correlations, and risk signals that traditional methods might miss. In India's diverse lending landscape, where borrower

behaviour differs across regions, income levels, and employment types, AI models provide flexible risk assessments that enhance credit decision accuracy (Machado, 2025). The decision-making part of the framework converts these risk predictions into practical lending actions such as approving or rejecting loans, setting credit limits, adjusting interest rates, and defining repayment terms. Automated decision systems ensure consistency and minimize bias in these decisions, which is vital for high-volume retail and MSME lending in India (Deloitte, 2024).

Regulatory and governance mechanisms are a key component of the framework. Indian financial institutions must ensure that AI-powered lending systems comply with regulatory guidelines that focus on transparency, data privacy, and consumer protection. The Reserve Bank of India promotes responsible use of digital lending technologies, emphasizing the importance of proper oversight, auditability, and grievance redressal processes.

In summary, India's AI-driven credit scoring and loan underwriting system integrates varied data sources, advanced analytics, automated decision-making, and regulatory oversight. This combined approach promotes more inclusive, efficient, and risk-conscious lending, overcoming the structural challenges faced by traditional credit evaluation methods in the Indian environment.

AI Models Used in Credit Scoring and Loan Underwriting in India

Indian financial institutions increasingly rely on AI-based models to improve credit scoring and loan underwriting accuracy across retail, MSME, and digital lending sectors. These models are crafted to handle the diverse borrower profiles in India, where income patterns, employment structures, and credit histories differ significantly. Unlike traditional statistical methods, AI models provide greater flexibility in managing large, varied datasets and adapting to changing borrower behaviors (Bussmann et al., 2023). Supervised machine learning models are widely used in Indian lending. Techniques like logistic regression, decision trees, random forests, and support vector machines (SVM) are trained on historical loan data to forecast repayment behavior and default risk. Logistic regression remains popular for its interpretability and regulatory approval, but ensemble models like random forests offer better predictive accuracy by capturing complex interactions among borrower features, making them especially suited for India's data-rich digital lending landscape (Machado, 2025).

Deep learning models, such as artificial neural networks (ANN) and deep neural networks (DNN), are increasingly important in Indian fintech and NBFC lending platforms. They excel at analyzing unstructured and semi-structured data like transaction descriptions, digital application inputs, and behavioral signals from mobile and online activities. This capability improves credit evaluation, especially for thin-file borrowers, a common segment in India (European Central Bank, 2024). Additionally, unsupervised learning methods enhance credit risk assessment in the region. Clustering algorithms classify borrowers into risk groups, while anomaly detection models spot unusual transaction patterns that could signal fraud or higher default risk. These techniques bolster portfolio monitoring and early warning systems, which are vital in high-growth lending portfolios (World Bank, 2023).

In response to growing regulatory focus on transparency, Indian lenders are increasingly implementing explainable AI (XAI) methods. These techniques help institutions clarify and communicate the reasons behind credit decisions, ensuring compliance and building borrower trust. Transparency is particularly important in India, where consumer protection and grievance redressal are becoming more prominent (Deloitte, 2024).

Overall, AI models have enhanced risk prediction, operational efficiency, and financial inclusion in India's credit scoring and loan underwriting. Nevertheless, successful implementation depends on meticulous model selection, continuous validation, and adherence to regulatory and ethical standards to promote responsible and sustainable lending.

Benefits of AI-Powered Credit Scoring and Loan Underwriting in India

Integrating Artificial Intelligence into credit scoring and loan underwriting has brought notable advantages to the Indian financial sector, especially in tackling long-standing issues related to efficiency, inclusion, and risk control. A key benefit is the heightened precision in assessing credit risk. AI models process extensive borrower

data, allowing lenders to better identify default risks compared to traditional approaches that depend on limited financial metrics. This improved accuracy leads to higher-quality loan portfolios and fewer non-performing assets in Indian banks and NBFCs (Bussmann et al., 2023). Another significant benefit is operational efficiency. AI-powered underwriting automates essential parts of the lending process, such as data verification, risk scoring, and eligibility checks. This automation drastically shortens loan processing times, facilitating quicker credit issuance. In India's large retail lending and digital credit markets, such efficiency is vital for meeting customer needs and staying competitive (Deloitte, 2024).

AI-driven credit scoring significantly contributes to improving financial inclusion in India. A considerable portion of the population, especially MSMEs, gig workers, and those in the informal sector, lack detailed formal credit histories. Using alternative data like digital payment logs and transaction patterns, AI enables lenders to evaluate creditworthiness outside traditional credit bureau scores, thus broadening access to formal credit (World Bank, 2023). Additionally, consistency and objectivity in lending decisions are strengthened by AI systems. Automated evaluations reduce reliance on personal judgment and promote standardized decision-making. When well-designed and properly overseen, AI can facilitate fairer lending outcomes by limiting discretionary biases in underwriting (European Central Bank, 2024).

AI enhances risk monitoring and portfolio management by enabling models to learn continuously. This allows credit assessments to be updated dynamically based on new borrower information and evolving economic conditions. Such adaptive monitoring is especially important in India, where economic volatility and sectoral changes can greatly influence borrowers' repayment ability (Machado, 2025).

In summary, AI-driven credit scoring and loan underwriting provide significant benefits to India's lending landscape by improving accuracy, efficiency, inclusion, and risk management. These benefits highlight the increasing role of AI in fostering sustainable credit growth within the Indian financial industry.

Challenges and Risks of AI-Based Credit Scoring and Loan Underwriting in India

Despite the increasing adoption of Artificial Intelligence in India's lending sector, several challenges and risks come with AI-based credit scoring and loan underwriting systems. A key concern is algorithmic bias, as AI models trained on historical data may reflect existing socio-economic disparities across regions, income levels, and employment types in India. If unaddressed, such biases can unfairly exclude certain borrower groups, compromising the goal of inclusive lending (Bussmann et al., 2023). Data quality and availability also pose significant challenges. While digital financial data has grown rapidly, issues like inconsistencies, incomplete records, and fragmented sources are common, especially among MSMEs and informal sector borrowers. Poor data quality can affect model accuracy and lead to incorrect credit assessments (World Bank, 2023). Additionally, data privacy and security remain critical concerns. AI-based credit evaluation depends heavily on personal and behavioral data, raising risks of misuse, breaches, and unauthorized access. In India, where data protection laws are still developing, financial institutions must ensure responsible data collection, secure storage, and transparent data practices to maintain borrower trust and comply with regulations (European Central Bank, 2024).

Model transparency and explainability present additional difficulties. Many advanced AI models, especially deep learning systems, are often not interpretable, making it hard for lenders to clarify credit decisions to borrowers and regulators. This issue is especially significant in India, where there is increasing regulatory focus on consumer protection and grievance redressal mechanisms (Deloitte, 2024). Regulatory uncertainty further hinders AI implementation. Though Indian regulators support innovation in digital lending, the lack of comprehensive AI-specific regulations leads to uncertainty about acceptable practices, accountability, and liability. As a result, financial institutions must navigate a complex regulatory environment while ensuring their AI systems comply with existing lending and consumer protection standards (Machado, 2025).

In summary, AI-based credit scoring and loan underwriting provide notable advantages in India. However, their deployment involves risks such as bias, data quality issues, privacy concerns, transparency problems, and regulatory challenges. Effectively managing these risks with strong governance, ongoing model audits, and

ethical AI standards is crucial for the long-term development of AI-driven lending within India's financial industry.

Regulatory and Ethical Considerations in AI-Based Lending in India

The growing use of Artificial Intelligence in credit scoring and loan underwriting in India has raised important regulatory and ethical issues in financial oversight. As AI-driven systems take on a more central role in lending processes, ensuring transparency, fairness, and accountability has become crucial to protect borrowers and ensure financial stability.

In India, the regulation of AI-enabled lending is guided by the broader principles of digital lending and consumer protection issued by the Reserve Bank of India. The regulator focuses on responsible innovation, data privacy, transparency in decision-making, and effective grievance redressal. AI-based credit systems are expected to operate within current laws concerning fair lending practices, customer consent, and disclosure requirements, even as specific regulations for AI continue to develop (Deloitte, 2024).

Transparency in credit decisions is a vital regulatory requirement. Borrowers have the right to know why their loan was approved or rejected, which challenges complex AI models that are often hard to interpret. To address this, Indian lenders are increasingly advised to use explainable AI techniques that can offer clear, understandable explanations for automated decisions, thereby improving regulatory compliance and building borrower trust (European Central Bank, 2024).

In the Indian context, ethical issues surrounding fairness and non-discrimination are especially important due to socio-economic diversity and regional inequalities. AI models must be carefully developed and supervised to prevent bias against specific demographic or occupational groups in lending decisions. Conducting regular bias assessments, validating models, and conducting independent audits are vital for maintaining ethical lending practices and promoting inclusive growth (Bussmann et al., 2023).

In summary, regulatory and ethical considerations play a crucial role in shaping the adoption of AI-powered credit scoring and loan underwriting in India. Aligning technological innovation with transparency, fairness, data protection, and accountability is essential for building a trustworthy and sustainable AI-driven lending ecosystem.

Future Trends and Research Directions in AI-Powered Credit Scoring and Loan Underwriting in India

The ongoing progress of Artificial Intelligence is likely to further transform credit scoring and loan underwriting in India. A notable emerging trend is the increased focus on explainable and transparent AI systems. As regulatory oversight becomes more rigorous, Indian financial institutions are increasingly adopting models that not only achieve high predictive accuracy but also offer interpretable and justifiable credit decisions (European Central Bank, 2024). Another significant trend is the broader use of real-time and alternative data, facilitated by digital payment systems and open banking initiatives. The widespread use of digital transactions across India allows lenders to access continuous data streams, enabling dynamic credit scoring and proactive risk management. This development is anticipated to improve early default detection and support the creation of more personalized lending products suited to diverse borrower needs (World Bank, 2023).

Hybrid decision-making frameworks that combine AI analytics with human expertise are increasingly used in India's lending sector. These models help reduce risks linked to full automation and enhance resilience during economic fluctuations. Human oversight remains crucial in India's diverse credit market, where understanding local context can greatly affect lending results (Machado, 2025). Future research will likely explore the long-term effects of AI-based credit scoring on financial inclusion and credit sustainability in India. Although AI shows potential in expanding credit access, more empirical data is needed to evaluate its impact on borrower well-being, repayment patterns, and systemic risk over time (Bussmann et al., 2023). Additionally, studies on regulatory policies and ethical AI governance in Indian financial services are expected to increase. Comparing India's strategies with those of other emerging economies could offer valuable insights into best practices for balancing innovation, regulation, and consumer protection (Deloitte, 2024).

Overall, advancements in AI-powered credit scoring and loan underwriting in India will be influenced by technological progress, regulatory changes, and ethical issues. Ongoing research and policy efforts will be crucial to ensure AI-based lending promotes inclusive, stable, and sustainable financial development.

CONCLUSION

Artificial Intelligence has become a transformative force in India's credit scoring and loan underwriting sectors, changing how financial institutions evaluate borrower risk and extend credit. By utilizing advanced machine learning techniques and various data sources, AI-powered systems have improved prediction accuracy, made underwriting more efficient, and enabled quicker, more consistent lending decisions across banks, NBFCs, and fintech companies.

In India, AI has been especially helpful in tackling longstanding issues related to financial inclusion. Incorporating alternative data like digital payment histories and transactional patterns, AI-based credit scoring has improved access to formal credit for MSMEs, informal sector workers, and thin-file borrowers. This not only fosters inclusive economic growth but also enhances portfolio quality and risk management.

However, AI adoption in lending also raises challenges such as bias, data privacy concerns, transparency, and regulatory compliance. Addressing these issues through explainable AI, strong data governance, and human oversight is crucial for maintaining borrower trust and promoting responsible lending. The Reserve Bank of India's regulatory guidance is vital in guiding ethical and compliant AI use in the country's financial industry.

Overall, AI-driven credit scoring and loan approval processes have great potential to enhance India's lending ecosystem by boosting efficiency, fostering inclusion, and increasing resilience. Future advancements will rely on harmonizing technological innovation with regulatory standards, ethical considerations, and the socio-economic context of India. When implemented responsibly, AI can become a crucial driver of sustainable and inclusive credit expansion in India.

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