

A COMPREHENSIVE REVIEW STUDY FOR EXPLORING THE REVOLUTIONARY ROLE OF ARTIFICIAL INTELLIGENCE IN FINANCIAL SECTOR

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Abstract

The dynamic transformation due to integration of Artificial Intelligence (AI) into financial services has stimulated a foundational revolution across the global financial landscape. An exploratory review of the revolutionary role artificial intelligence (AI) plays in reorienting critical financial functions like banking, investment management, credit evaluation, fraud detection, risk mitigation, and regulatory compliance is presented in this review article. In addition to examining the main AI technologies—such as blockchain, machine learning, and natural language processing—this article has also emphasized the benefits, uses, and disruptive potential of these technologies in financial ecosystems. The global examples in this article also demonstrate how AI has changed the financial sector's decision-making process, incorporated itself into the operational frameworks of conventional financial services, and reshaped the nascent Fintech industry. In order to guarantee methodological rigor and thorough coverage, this review study used a narrative analysis approach, concentrating on articles from the Web of Science database. It concludes by outlining potential research avenues and policy ramifications, promoting a well-rounded strategy that balances innovation with accountability, transparency, and transparency.

Keywords: Artificial Intelligence (AI), Fintech, Finance, financial services, Narrative analysis, literature Review

1. INTRODUCTION

The financial sector has experienced a drastic change which is driven by incorporation of AI into financial sector. AI technologies play a vital role in detection of frauds integrating with other technologies such as machine learning, blockchain. The hybrid models combining AI technologies

such as machine learning like Convolutional Neural Networks (CNNs), can assess large volumes of transactional and textual datasets in smart contracts to recognize any suspicious activities in real time. This has made the digital payments more trustworthy(Louati et al., 2024). Blockchain technologies are basically known for making the payment system more transparent and trustable and have smoothen the transaction processes for various organizations. The combination of blockchain with artificial intelligence and other advance technologies such as smart contracts have automated the execution of contacts which not only saves the cost but also ensure faster and efficient settlements (Almasria et al., 2024) (Ghaemi Asl & Roubaud, 2024) . Smart contract technology has made the acceptance of contracts automated which avoids delays and human errors. This has also facilitated the cross – border lending services(Ghaemi Asl & Roubaud, 2024).Furthermore these technologies are supporting pillars for innovation in fintech. The integration of AI and blockchain respond quickly to changing market trends like market shocks which has proven their relevance in changing financial system(Su & Zhao, 2025).Such technologies have also brought an immense shift in green finance for ensuring transparency and accountability in sustainable investments(Li et al., 2025a)(Boumaiza, 2025). These technological innovations have empowered various fintech platforms to detect fraudulent activities and ensure ethical financing. These advanced technologies will significantly decrease the risk involved in audit and financial reporting which will build the trust of investors in such technologies. (Elnahass et al., 2024).The Integration of AI with blockchain will reduce the cost and furthermore it will strengthen the regulatory compliance, which is essential for ethical, transparency and assist in building financial ecosystems(Secinaro et al., 2025) . The integration of AI and blockchain have brought a great evolution in financial sector as it is a significant pillar for achieving the goal of digital financial inclusion and improved access to credit facilities for small and micro companies(Jin & Liu, 2024). The analytical system based on AI and their credibility and transparency checked by blockchain leads to improved delivery of small credits and ensuring operational resilience (Offiong et al., 2024). These technologies have innovated the core functions including credit ratings, detection of frauds, and legal and regulatory compliance, thus ensuring development and competitive agility within the financial industry(Trotta et al., 2024). Overall, they have revamped the way financial services are delivered and governed, fostering to develop a sustainable financial ecosystem.AI is reshaping the financial sector through automation, predictive analytics, and decision-making support. AI enhances stock valuation by integrating behavioral and fundamental models, such as sentiment indices and revenue growth projections based on R&D investments. For example, valuation models for AI-linked companies like Nvidia incorporate current vs. future P/E ratios and AI relevance in market sentiment ((Bonaparte, 2024)). Additionally, AI drives industrial transformation by boosting production efficiency and fostering intelligent business models,

especially when supported by inclusive finance mechanisms(Zhang, 2025) . It also promotes energy resilience by optimizing energy data, forecasting system shocks, and reducing waste through smart infrastructure, thus improving operational and environmental sustainability(Nepal et al., 2025). Moreover, financial institutions increasingly use AI to assess environmental risks, enabling targeted green investments and enhancing the effectiveness of sustainable finance(Kuang et al., 2024). Despite extensive research on AI in financial services, existing studies remain fragmented, often focusing on isolated applications such as fintech automation or risk management, with limited integrative analysis of sustainability, ESG analytics, and governance. Moreover, the role of explainable AI in enhancing transparency and regulatory compliance is insufficiently synthesized. Addressing this gap, the present study offers a comprehensive narrative review of recent literature (2024–2025), integrating AI, green finance, ESG, and fintech perspectives. The study contributes a unified conceptual understanding of AI-driven financial transformation while identifying key challenges and future research directions.

2. LITERATURE REVIEW

2.1 UNDERSTANDING ARTIFICIAL INTELLIGENCE IN FINANCE

AI is described as the combining human intelligence with machines specially the computer systems. It involves learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions), and self-correction. AI has become indispensable part of various sectors and the financial services for enhancing the operational efficiency and improving the experience of customers and enables in taking decisions which is data – driven. The definition of AI was first evolved by John McCarthy in 1956, and today it is composed of wide range of intelligent technologies like machine learning (ML), natural language processing (NLP), predictive analytics, and AI-powered chatbots and virtual assistants (Ahmed et al., 2022; Pattnaik et al., 2024).

Machine Learning is among the most frequently used AI technologies in finance. It consists of training algorithms to make future predictions using historical data. Financial organizations employ machine learning for various functions like recording credit scores, portfolio management , algorithm based trading and detection of frauds (Chen et al., 2023).the other most important AI technology is natural language processing which helps in understanding and processing of human language.in financial sector NLP is used for analyses of sentiments of financial news , reports on market trends and social media feeds to predict movements in stock markets and identify any risk involved (Quinn, 2023).The Predictive analytics capability of artificial intelligence technologies is employed in various statistical methods and data mining techniques for forecasting future outcomes. This application of AI is very essential in making strategic financial plans, managing risk and revenue forecasting (Mohsin & Nasim, 2025).

The chatbots and virtual assistants which are driven by AI have brought a significant transformation in various financial services like offering 24/7 consumer support, automating transactions, and giving financial suggestions. This will not only lead to significant reduction in cost but will also enhance customer experience by providing personalized services (Judijanto, 2025). overtime the role of AI in finance sector has significantly transformed. In the 1980s and 1990s, the field saw the use of rule-based expert systems. The 2000s witnessed the expansion of AI driven applications due to the explosion of big data and computational power. Since 2015, AI adoption in finance has grown rapidly, driven by advances in ML algorithms, data availability, and regulatory openness toward innovation (Moura et al., 2025). Recent bibliometric analyses further confirm this shift. For example, Springer (2025) identifies a marked increase in AI-finance publications from 2016 to 2023, focusing on explainable AI (XAI), automation, and FinTech convergence. These developments are reshaping financial decision-making by improving transparency, accuracy, and credibility.

3.APPLICATION OF AI IN FINANCE SECTOR

3.1 Green finance - Green finance is defined as the financial activities which are focused on promoting sustainable development by directing investments toward environment friendly and low-carbon emission projects(C. Wang et al., 2025) It plays an important role in addressing the problem of climate change by aligning financial models with environmental objectives by giving immense support to clean energy projects and eco- friendly infrastructure(Kuang et al., 2024).The combination of green finance into national economies enhances its capability to ability to mitigate environmental risks(Ke et al., 2025). The green finance serves as the catalyst for the growth of green industries by promoting responsible consumption, production, and the adoption of circular economy principles(Kuang et al., 2024). In this modern world of technological upgradations, the collaboration of green finance and AI will assist in better allocation of capital for achieving sustainable goals.(C. Wang et al., 2025). The introduction of tools driven by AI in financial industry have smoothen the process of credit risk assessment, timely detection of fraudulent acts, and investment forecasting through real-time data analysis and machine learning models(Nepal et al., 2025).AI has come up with significant revolution in green financial markets by automating compliance procedures and ESG data processing, which helps in increasing motivation level of investor (Li et al., 2025b). The AI tools has enabled various financial institutions to design dynamic climate risk models assisting in making adaptive strategy under unpredictable conditions. AI tools are equipped with optimization of portfolio in managing the assets which helps in better alignment with sustainability goals while mitigating exposure to environmental risks(Barile et al., 2025) . In China's(C. Wang et al., 2025) banking sector introduction of AI tools has improved Environmental Sustainability Performance (ESP), with its integration with green innovation and sustainable banking(Siddik et al., 2025).AI technologies has

helped in decreasing pollution levels by encouraging green lending and aligning bank practices with nations environmental protection policies and goals(Siddik et al., 2025).

3.2. STOCK VALUATION AND INVESTMENT FORECASTING

AI has come up with great revolution in stock valuation practices through introduction of models based on Price-to-Earnings (PE) ratios and R&D-to-revenue ratios, which assist in assessing organizations like NVIDIA are overbought or underpriced(Bonaparte, 2024). AI tools are also driven with sentiment analysis technique which now reflects investor behaviour based on Google trends of tech-related keywords are now used to reflect investor behaviour (Bonaparte, 2024). the AI service sector is continuously growing which has currently show 50% of AI revenue which is expected to increase to 75% by 2032 which is highlighting the shift in financial focus toward service-oriented AI businesses(Bonaparte, 2024). It is clearly predicted that AI market will rise globally from \$129.28 billion in 2022 to \$2.74 trillion by 2032, with a 36.8% CAGR, indicating enormous investment opportunities(Bonaparte, 2024).

3.3 AI FOR INDUSTRIAL AND FINANCIAL SYSTEMS TRANSFORMATION

AI is a strong pillar for industrial revolution by increasing productivity, encouraging smart manufacturing, and enhancing service quality in finance through automation and process optimization(Zhang, 2025). The development of inclusive finance practices using AI applications will help in reducing finance costs and expanding its accessibility to underdeveloped regions(Kumar Tarra & Kumar Mittapelly, 2024).

3.4 EXPLAINABLE AI (XAI) IN FINANCIAL DECISION-MAKING

-Explainable AI (XAI) has been successfully applied various practices such as detection of frauds, credit scoring, approval for loans, and analyzing risk and ensuring transparency to investors or users(Saarela & Podgorelec, 2024). The most widely used methods in finance are SHAP and LIME, which assist in explaining predictions in models used by banks, insurers, and investment firms(Saarela & Podgorelec, 2024).

3.5.AI CHATBOTS AND ESG ANALYTICS AI chatbots are deployed to extract and analyze data from various reports on sustainability, systemizing financial assessments for ESG investments(Boloş et al., 2024). These chatbots are equipped with instant retrieving of particular financial metrics which improves the decision making of investors and improves the organizational agility in a digital finance landscape(Boloş et al., 2024). AI – driven large language models are implemented for streamlining Management Discussion & Analysis (MD&A) sections of financial reports, offering investors with clear and digestible insights(Saxena & Rishi, 2025). Generative Tools like ChatGPT helps in automating data extraction from ESG and sustainability reports, improving

financial assessment in green investment projects. (Saxena & Rishi, 2025)

3.6 REDUCING FINANCING CONSTRAINTS AND IMPROVING TRANSPARENCY: AI HAS ALSO TRANSFORMED THE FINANCE

At the corporate level, by enhancing the investments for various environmental protection projects and resultantly easing out financing constraints and improving transparency through better information dissemination(J. Wang et al., 2025).

3.7 OPERATIONAL EFFICIENCY AND AUTOMATION

AI has automated various routine and daily task I banking sector such as regulatory check and customer services which gives time to employees to focus on core activities and making strategic decisions(Siddik et al., 2025).

4. CHALLENGES

1.Overvaluation and Market Bubble Risks- A major concern is the possibility of an AI-driven stock bubble, akin to the dot-com bubble of the 1990s, especially as valuations surge without corresponding earnings growth(Bonaparte, 2024). There remains a lack of standardized valuation methods for AI-related stocks and ETFs, making consistent investment analysis difficult(Bonaparte, 2024).

2. Regional Disparities and Adoption Gaps- The effectiveness of AI varies across regions, as its impact is influenced by the region's economic development threshold, leading to uneven adoption and benefits(Kumar Tarra & Kumar Mittapelly, 2024).Regions which lacks the basic infrastructure facilities or inappropriate economic activities generally face problems in successful deployment of AI technologies readiness(Zhang, 2025).

3.Explainability and Reliability Issues in XAI- In XAI, a prominent limitation is the over- dependence on anecdotal validation or expert intuition rather than robust quantitative metrics, lading to reduction in trust level in results (Saarela & Podgorelec, 2024). Techniques like LIME can proved to be inappropriate in generating various explanations for the same prompts and input data given, which puts the credibility of decision-making in danger specially in sectors like banking which involves high -risk(Saarela & Podgorelec, 2024).

4. Ethical, Regulatory, and Workforce Challenges- There's a rising concern in various aspects related to ethical and regulatory oversight of AI in finance, biasness in AI algorithms, data privacy, and consumer protection(Boloş et al., 2024). The skills gap is another challenge, as finance professionals must adapt quickly by developing AI literacy, which requires institutional support and continuous reskilling(Boloş et al., 2024).

5. METHODOLOGY

This review study has employed narrative analysis approach to critically examine the transformation AI has brought into financial sector. Narrative analysis is appropriate methodology for qualitative

study for examining and exploring complex multidisciplinary developments and mapping thematic changes over time (Riessman, 2008). This article has been prepared by systematically examining the research articles on web of science database. This database was selected to ensure the credibility and relevance of our study. We have generally included the recent articles in our study so that we can uncover all the recent developments in finance sector. The analysis has identified the key areas such as AI-driven automation, customer personalization, credit risk modelling, fraud detection, algorithmic based stock trading, and ethical and regulatory implications. These themes are explored after tracing the recurring patterns followed in various research papers. We have chosen narrative approach in our study for better conceptual understanding of this upcoming theme. It enables holistic understanding of role of AI technologies in revolutionizing financial decision-making, operational models, and regulatory frameworks. Through critical examination of scope of AI in finance, the chapter provides a multifaceted depiction of both the future possibilities and the challenges that clearly elucidate this technological revolution. This study has employed a structured narrative review methodology to synthesize interdisciplinary research on the application of AI in financial services. Narrative reviews are particularly suitable for examining emerging and conceptually diverse domains where theoretical integration is required rather than statistical aggregation (Riessman, 2008).

The Web of Science (WoS) Core Collection database was selected due to its comprehensive coverage of high-quality, peer-reviewed journals in finance, management, technology, and sustainability. The review primarily focuses on studies published between 2019 and 2025, with special emphasis on recent literature (2024–2025) to capture contemporary advancements in AI-driven finance.

A structured keyword search strategy was employed using the following combination: “Artificial Intelligence,” and “Finance”. Boolean Search was conducted within titles of the publications.

Inclusion criteria consisted of:

- (i) peer-reviewed journal articles,
- (ii) English-language publications,
- (iii) explicit focus on AI applications in financial services, and
- (iv) studies linking AI with sustainability, ESG, fintech innovation, or governance.

Exclusion criteria included conference proceedings, editorials, book reviews, and studies with purely technical AI discussions lacking financial or managerial relevance.

Relevant articles were screened through title and abstract review, followed by full-text examination. The selected literature was thematically synthesized into recurring conceptual domains such as AI-driven automation, ESG analytics, green finance, explainable AI, fintech integration, and ethical-regulatory challenges.

6. RESULTS AND DISCUSSION

The narrative synthesis of the reviewed literature has clearly indicated that Artificial Intelligence has put up as a transformative enabler across multiple domains of financial services. The findings indicate that AI-driven applications significantly enhance operational efficiency through automation, real-time analytics, and predictive decision-making, particularly in areas such as fraud detection, credit risk assessment, and algorithmic trading. A prominent finding relates to the growing role of AI in advancing green finance, where machine learning models and big data analytics facilitate ESG data processing, climate risk assessment, and optimized green investment allocation. The review further highlights the increasing adoption of explainable AI (XAI) frameworks, such as SHAP and LIME, to improve transparency, accountability, and regulatory compliance in financial decision-making. FinTech integration emerges as another critical outcome, enabling financial inclusion, improved customer engagement, and streamlined regulatory processes. However, the findings also underscore persistent challenges, including algorithmic bias, model opacity, data quality limitations, and regulatory uncertainty, which constrain the full realization of AI's potential. Overall, the results confirm that while AI substantially strengthens efficiency, sustainability, and governance in financial systems, its long-term effectiveness depends on the development of robust ethical frameworks, explainability mechanisms, and adaptive regulatory policies.

As a narrative review, this study does not report empirical results. Instead, key findings are summarized through structured thematic tables to enhance clarity and scholarly synthesis.

Table 1: Major AI Applications in Financial Services

Application Area	AI Technologies	Financial Functions	Key References
Fraud Detection	ML, CNNs, Blockchain	Transaction monitoring, anomaly detection	Louati et al. (2024)
Credit Risk Assessment	ML, Predictive Analytics	Credit scoring, loan approvals	Jin & Liu (2024)
Stock Valuation & Trading	NLP, Sentiment Analysis	Asset pricing, forecasting	Bonaparte (2024)
Green Finance & ESG	AI, Big Data, Blockchain	Climate risk modeling, ESG scoring	Kuang et al. (2024); Li et al. (2025a)
Explainable AI (XAI)	SHAP, LIME	Transparent financial decisions	Saarela & Podgorelec (2024)
FinTech Automation	Chatbots, RPA	Customer service, compliance	Siddik et al. (2025)

Table 2: Benefits and Challenges of AI Adoption in Finance

Dimension	Benefits	Challenges
Operational Efficiency	Automation, cost reduction	Algorithmic over-dependence
Decision Quality	Improved forecasting accuracy	Model opacity, bias
Sustainability	Enhanced ESG transparency	Data quality, greenwashing risks
Governance	Real-time compliance monitoring	Regulatory uncertainty
Workforce Impact	Productivity enhancement	Skill gaps, job displacement

Table 3: Role of AI in Advancing Green Finance

Green Finance Function	AI Contribution	Sustainability Outcome
ESG Data Processing	Automated text and data analytics	Improved disclosure quality
Climate Risk Analysis	Scenario modelling and forecasting	Enhanced risk mitigation
Green Credit Allocation	AI-based scoring models	Increased green lending
Investment Optimization	Portfolio optimization algorithms	Alignment with SDGs

The discussion highlights three interrelated dimensions of AI-driven financial transformation. First, AI most importantly improves the operational efficiency by automating routine tasks, enhancing the forecasting accuracy, and enabling real-time risk monitoring. Second, AI strengthens sustainability and governance mechanisms through ESG analytics, green finance integration, and responsible investment decision-making. Third, despite these advantages, unresolved concerns regarding algorithmic bias, transparency, and regulatory oversight persist, underscoring the necessity of explainable AI frameworks and ethical governance structures.

7. CONCLUSION

The combination of AI into the financial sector has laid the ground for a revolutionary shift, significantly reshaping how financial services are structured, delivered, and governed. In addition to increasing operational efficiency, massive AI tools and technologies like machine learning, blockchain, natural language processing, and predictive analytics have profoundly transformed the

ways financial decisions making is done. AI has become a vital component of the contemporary financial ecosystem, enabling everything from better fraud detection and credit risk modelling to intelligent stock valuation and inclusive financial access. Its function in green finance, in particular, has been crucial in managing climate-related risks, automating the processing of ESG data, and guiding investments toward environmentally sustainable projects. A more robust and sustainable financial architecture is promoted, systemic risk is decreased, and ethical practices are supported by this technological infusion into the financial industry. Nevertheless, careful consideration of algorithmic fairness, transparency, and governance frameworks that balance innovation and accountability are necessary to fully realize AI's potential. This review summarizes as per the review conducted on recent literature to demonstrate that AI not only serve as a technological enhancement but a strategic enabler of sustainable and transparent financial systems. The findings confirm that AI supports efficiency, green finance, ESG integration, and governance innovation. However, ethical challenges, explainability concerns, and regulatory gaps remain significant. These problems can be addressed through balanced AI governance frameworks which is very crucial to fully realize AI's transformative potential in finance.

8. IMPLICATIONS OF THE STUDY

For technologists, financial managers, and policymakers, this study has a variety of ramifications. The results emphasize the pressing need for legislators to create flexible regulatory frameworks that deals with the problems related to data privacy, biasness in AI algorithms, and ethical issues. By using AI to improve credit evaluation, automate processes to improve consumer satisfaction, and streamline operations while maintaining compliance, financial managers can gain strategic value. The study emphasizes the significance of ongoing AI upskilling and infrastructure investment for FinTech innovators and technology leaders in order to sustain technological relevance and competitiveness. Furthermore, the combination of AI and sustainable finance creates opportunities for environmental economists and regulators to develop tools that encourage ethical investing. The ramifications also affect educational institutions, which need to redesign their curricula to give aspiring financial professionals multidisciplinary knowledge of AI and finance. In order to improve capital allocation, investors and financial analysts can also use AI tools for risk profiling and real-time market sentiment analysis.

By using real-time surveillance tools to identify irregularities and financial crimes, regulatory agencies can also generate profits through the assistance of AI technologies. More broadly, by providing services to underbanked populations via mobile-based platforms and automated credit scoring, AI integration promotes financial inclusion. Finally, the study's conclusions can be used as a roadmap for creating moral AI governance structures that strike a balance between creativity,

responsibility, and the impact on society.

9. FUTURE DIRECTIONS AND LIMITATIONS

The study offers a thorough grasp of how AI is transforming the financial services, but it has significant limitations that should be addressed in upcoming research studies. The findings' generalizability is limited because of adoption of a qualitative narrative analysis, especially when applied to different geographic and economic contexts. Furthermore, because AI is dynamic, current trends and applications may change quickly, requiring constant review and updating of knowledge. Because emerging and underdeveloped regions may face different technological, regulatory, and infrastructure challenges, the preponderance of literature from developed economies further restricts the conclusions' global applicability. In order to examine the diversity in AI adoption, future research should concentrate on empirical, cross-national studies, paying particular attention to developing nations. To foster trust and improve decision-making transparency, further research into explainable AI (XAI) models in finance is also imperative. The socioeconomic ramifications of AI-driven automation in finance, including its effects on employment, necessary skill sets, and ethical governance, should be investigated by researchers. Furthermore, more empirical evidence is needed to support AI's contribution to green finance, specifically in the areas of ESG analytics, climate risk modelling, and sustainable investing. Future research can provide more comprehensive, inclusive, and globally applicable insights into the convergence of AI and finance by tackling these areas.

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