

# Investigating the Potential Areas in Artificial Intelligence and Financial Innovation: A Bibliometric Analysis

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## ABSTRACT

In recent years, there has been widespread interest in the applications of Artificial Intelligence (AI) techniques to the financial sector and in the development of new financial products and services. AI methods are widely regarded as the most important methods in the emerging market for providing not only cutting-edge financial services, but also an innovative approach to business process automation, a solution to the challenges of reducing service costs associated with managing low-income and rural customers and a method of identifying and evaluating the creditworthiness of those customers. No clear reviews are identified in the areas of AI and its contribution to Financial Innovations (FI) research in finance. To address the above gap, the present study provides a systematic literature review and bibliometric view of AI and FI research in finance. Co-citation, co-occurrence and bibliographic coupling analysis techniques are being used to make inferences about the structure of AI and FI research in finance from 1987 to 2022. The study used 237 filtered research articles from the Scopus database and processed through VOS-Viewer and Biblioshiny through "R" to justify study objectives. Through bibliometric analysis, this study unveils influential authors, journals and institutions, emphasizing top-cited research articles and unveiling six emerging thematic clusters. The novelty lies in the identification of prominent keywords linked to AI and financial innovation research, accompanied by a comprehensive analysis of globally and locally cited articles. Employing an analytical approach, the study identifies research gaps to contribute to the existing body of knowledge.

**Keywords:** Artificial Intelligence, Financial Innovation, Bibliometric Analysis, Scopus Database.

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## INTRODUCTION

The integration of Artificial Intelligence (AI) and financial innovation presents an exciting and transformative journey for the financial industry. By harnessing the power of AI, financial institutions can unlock new opportunities, address challenges and drive sustainable growth. There is a significant gap between the ideal and actual state of affairs in the financial sector, with respect to the use of AI in delivering quality services. AI has an impact on all areas where digital processing is becoming more commonplace, such as retail, healthcare and education. In accordance with the study findings of Njegovanović,<sup>[1]</sup> Modern financial activities would be impossible to carry out in the absence of digital technology and algorithms capable of processing and analyzing the massive volumes of data generated

by financial institutions and markets. As a result, financial institutions, high-tech and telecommunications firms and the auto manufacturing and assembly industries were among the first to deploy AI.<sup>[2]</sup> It indicates that the roles of fintech in modern business has emerged.<sup>[3]</sup>

A report produced by EY (Ernst and Young), A leading company which identified use of AI in Indian financial system. This report reveals current information and perspectives on how the financial sector is ongoing in its utilization of AI technologies finds recent transformation in AI-driven operations, which are utilized for client interaction, analytics, decision support and tracking and recognizing behavior patterns to detect fraud and combat money laundering.<sup>[4,5]</sup> Financial sectors using AI include: In-app banking experience,<sup>[6,7]</sup> smart loans,<sup>[6,8]</sup> smart sales processes,<sup>[6]</sup> automated trading systems,<sup>[1,6]</sup> risk evaluation,<sup>[9]</sup> transaction data enrichment,<sup>[6,10]</sup> algorithmic systems,<sup>[1,11]</sup> portfolio management,<sup>[1,6]</sup> risk management,<sup>[12]</sup> personalized wealth management,<sup>[6]</sup> fraud detection and cyber security.<sup>[12]</sup> The studies that were described above can be concluded that there have been very little attentions given to AI research in the area of



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financial innovation. As a result, the authors of this study wish to use it to identify research gaps in the areas of artificial intelligence research and innovations in the financial sector.

According to a recent survey conducted all over the world, the vast majority of business leaders (62%) believe that artificial intelligence will become increasingly significant in their industry over the next five years. Among these executives, only 9% are positive that their company is prepared to fully implement AI. Banks and insurers, for example, they are only now beginning to grasp the breadth of this technology's potential applications.<sup>[13]</sup> From authors extensive literature review, it is evident that AI can supplement human interventions in workplaces in coming times.<sup>[14]</sup> The use of AI in financial innovation is anticipated to increasingly give financial firms a competitive edge through two main channels: (a) by increasing the efficiency of the firms through cost reduction and productivity enhancement, ultimately leading to higher profitability (e.g., enhanced decision-making processes, automated execution, gains from improvements in risk management and regulatory compliance, back-office and other process optimization); and (b) by improving the quality of the services provided by the firms (e.g. new product offering, high customization of products and services). Financial consumers can gain from such a competitive edge in two ways: either by lowering the price of the products or by improving their quality, variety and personalization.<sup>[15]</sup>

Analysis of worldwide research on Artificial intelligence in financial innovation from 1987 to 2022 is the primary objective of this study. Using a selection of 237 publications from a sample of journals from Scopus database analysis was done. Abad-Segura *et al.*<sup>[16]</sup> study giving importance to use of the systematic view for accumulating knowledge about Artificial intelligence in financial innovation in a global environment. The findings contributed to this field of study by allowing for the identification of the top driving agents, which include top authors, top research institutions and top countries, as well as current trending themes and future research areas.

Bibliometrics has been frequently used in the existing literature to analyze.<sup>[17]</sup> themes,<sup>[18]</sup> journals,<sup>[19]</sup> universities,<sup>[20]</sup> and countries.<sup>[21]</sup> The most prevalent bibliographic methods are citation and co-citation analysis, which highlight intellectual differences among citing and cited sources.<sup>[22]</sup> The current study provides a descriptive and network analysis of research in artificial intelligence in financial innovations. This data is used in our descriptive analysis as well as publications and citations.<sup>[23]</sup> Using a h-index, a g-index and an m-index, prolific sources and authors are shown to have a high productivity and influence.<sup>[24]</sup> We conduct keyword analysis to reveal the knowledge structure, developing trends and topics prevalent in the research domain;<sup>[25]</sup> however, co-word analysis reveals the Conceptual Structure (CS).<sup>[26]</sup> We use Bibliographic Couplings (BCs) and co-occurrences in our network analysis. The modularity class

and network width studies are used to examine interconnected communities, while the PageRank analysis identifies the most important ideas in the research subject.<sup>[27]</sup> A significant chunk of our study's mapping analyses is completed with the help of Biblioshiny, R and Vosviewer software packages. R and Biblioshiny help extract network files, while Vosviewer shows the bibliometric networks in a visually appealing way.

This study was based on a systematic review of important literature that was connected to AI in Financial Innovation. In addition, this study presented a bibliometric view of relevant work that was done in the subject domain on a global basis.

## Research Objectives

To study the current trend of research in Artificial Intelligence in Financial Innovation.

To explore the prominent contributors of AI in Financial Innovation research.

To identify the most significant articles in the domain of AI in Financial Innovation research.

To identify and present the most prominent research themes in the field of AI in Financial Innovation.

The above research objectives can be addressed through the following Research Questions (RQs):

RQ1. What is the current trend of research in Artificial Intelligence in Financial innovation?

RQ2. Which are the impactful, leading and influential sources and authors that contributed most significantly to the literature?

RQ3. Which articles in this research domain are Most Influential Articles (MIA)?

RQ4. What are the prominent themes prevailing in this field of research?

## METHODOLOGY

This study is the product of Systematic Literature Review (SLR) and bibliometrics' combined efforts.<sup>[28]</sup> The contextualized SLR method is applied in order to obtain the bibliographic data, which is then followed by a variety of bibliometric studies.<sup>[29]</sup>

## Data Extraction Strategy

We conducted an extensive exploration of the subject matter, employing a Systematic Literature Review (SLR) approach to meticulously examine and evaluate pertinent literature, aligning with established seminal works. Data for this study was sourced from the prominent database 'Scopus'. This database was chosen due to its comprehensive coverage of significant scientific outputs in the business and management domain.<sup>[30]</sup> This platform facilitates the organization and integration of data from diverse sources such as articles and book chapters into readily usable

bibliometric formats. Initially, we queried the Scopus database for titles, abstracts and keywords containing terms related to "Artificial Intelligence" OR "Machine Learning" OR "Deep Learning" OR "Data Analytics" OR "Data Science" AND "Financial Innovation" OR "Financial Engineering" OR "Financial Services". This initial search yielded 963 documents with the time span of 1987 to 2022. Following standard SLR practices, we restricted our search to 'articles' within specific subject areas such as Business, Management and Accounting and Economics, Econometrics and Finance, Computer Science, Decision Sciences, Social Sciences and Multidisciplinary. This search yielded 337 documents. Additionally, we applied an exclusion criterion requiring documents of source type from Journal with publication stage as Final and Article in press to be written in English, resulting in a refined sample of 327 scientific outputs. Finally, metadata for the documents in the final sample were extracted, including titles, authors' full names, corresponding authors' countries, total number of publications, citation counts, academic outlets, keywords, as well as institutional affiliations and countries. Following established SLR protocols,<sup>[31,32]</sup> we examined references cited by the papers found through the searches to ensure the completeness of the dataset.

### Methods for Conducting Research

To address the research inquiry, this paper utilizes three distinct types of bibliometric analysis techniques, as outlined by performance analysis, science mapping and network analysis.<sup>[33]</sup> The performance analysis method is deployed to evaluate the contributions of various research factors, such as authors, journals and countries, in the exploration of Fintech as a financial disruptor. This evaluation is grounded in the quantification of relevant publications and citations, unveiling the most cited or productive entities in the field.<sup>[34]</sup> The enumeration of citations and publications assists in establishing the significance of the research topic, scholar and journal, as indicated by Donthu et al.<sup>[33]</sup>

In recent years, bibliometric analyses have gained prominence as a methodological tool for assessing the scholarly landscape of AI in Financial Innovation. The foundational works of LAWANI<sup>[35]</sup> laid the groundwork for bibliometric analysis, providing a quantitative lens to evaluate the intellectual structure and evolution of research in various fields. The application of bibliometric techniques in role of AI in Financial Innovation, exemplified by Mhlanga<sup>[36]</sup> offers a structured approach to synthesizing the extensive body of knowledge in this rapidly evolving domain.

When performing a qualitative literature review, subjective bias is a real possibility. Bibliometrics, however, is one of the most accurate methods for eliminating this possibility.<sup>[37]</sup> A significant amount of bibliographic content is synthesized in bibliometric studies by using quantitative methods.<sup>[38,39]</sup>

## RESULTS AND DISCUSSION

### Tending areas of study and the scientific output

Figure 1 shows the trajectory of artificial intelligence in financial innovation research, with findings supporting an upward trend in the literature since 2018. Exact figures show that 78% of the papers considered in this analysis were published after 2018. Such data suggests that the post-2018 economic recovery is the primary context for the current round of artificial intelligence in financial innovation research theoretical discussions.

### Journals with the most impact and influence on the field of artificial intelligence in financial innovation research

The most prominent journals that have published articles related to artificial intelligence in financial innovation research are listed in Table 1. Through a systematic literature review of total of 237 articles, we have identified 10 number of journals are cited by the researchers in recent times. The most prominent journals according to the number of citations in the field of AI in Financial Innovation were 'Expert Systems with applications' with the highest citations of 367 and Scimago Journal Rank (SJR) 1.873

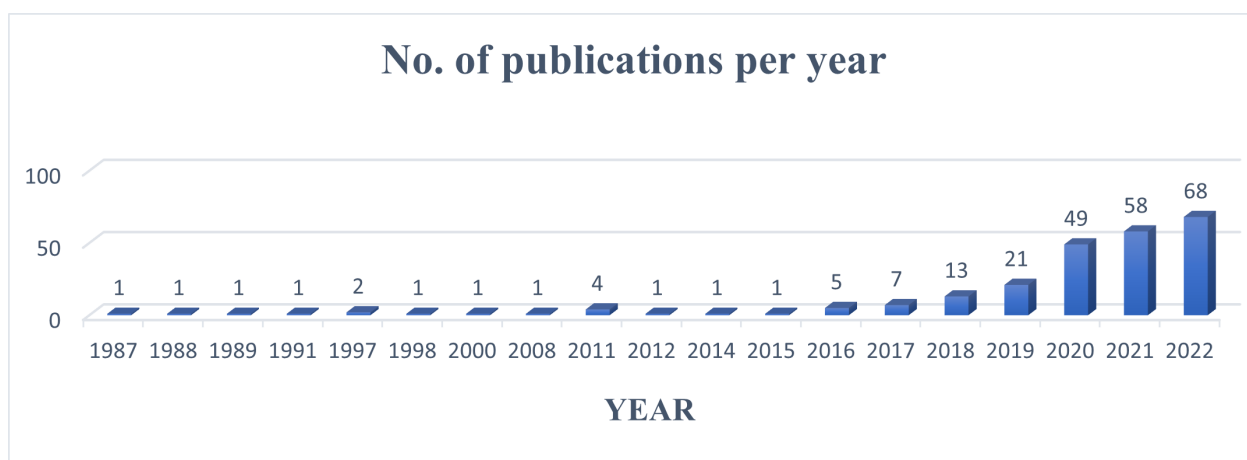


Figure 1: Research Trends in AI and FI Research.

from Elsevier publication house followed by the next prominent journal 'IEEE Access' with the total citations of 259 and SJR-0.926 from the same Elsevier publication house. Apart from these other prominent journals 'Decision support systems' ranks the third most cited journal with the total citations of 258 and SJR-2.076 also from Elsevier publication house. With respect to citation influence and journal impact in the form of *h*-index, *g*-index and *m*-index the top journal that influences the impact of artificial intelligence in finance research are the *Journal of behavioural and experimental finance* with *m*-index 1.25, *g*-index 5 and *h*-index 5, followed by IEEE Access with *m*-index 1, *g*-index 12 and *h*-index 6 and *sustainability Switzerland* with *m*-index 0.8, *g*-index 7 and *h*-index 4. From the above analysis through its identified factors i.e. No. of Publications, Total Citations, SCImago Journal Rank, (*h*,*g*,*m*-index), the study concluded that prominent journals with high impact factor indicate growth in developmental research<sup>[40]</sup> in the areas of AI in financial research and it also induces for further exploratory research interest.<sup>[21]</sup> This findings of the study slightly deviate earlier findings of Giudici *et al.*<sup>[41]</sup> The study primarily centers on leveraging AI for enhanced risk management but does not explicitly delve into the realm of financial innovation. Babina *et al.*<sup>[42]</sup> study have some kind of mixed opinion that AI holds the potential to contribute significantly to organizational growth, playing a pivotal role in fostering innovation, particularly in the realm of product development and innovations.

**The most influencing author on AI in FI and their contributions**

Table 2 highlights the most significant authors on the basis of total citations as well as author citation index. Ray M. Chang

is the top cited author among the top 10 with a citation score of 243 and highly cited in between 2012 to 2022 along with the next prominent author Sourabh Singh is the second highest cited author having total citations 186 and highly cited in between 2018-2022. Followed by Kuldeep Randhawa is the third most influential author on financial innovation with total citations 175 and frequently cited from 2013 to 2021, Mu-Yen Chen is the fourth prominent author emphasizing on FI technology in this chapter with total citations 128 and mostly cited between 2004 to 2022. However, author Arno De Caigny found as impactful author with the highest *h*, *g* and *m*-index: (2, 2 and 0.50 respectively) followed by Sourabh Singh with the next impactful author with *h*, *g* and *m*-index: (1, 1 and 0.25 respectively).

**Most influential articles on artificial intelligence in financial innovation research**

Table 3 encompasses the frequently referenced documents within the local database. Each entry in the Table 3 includes information such as Author, Year of publication, Local Citations, Global Citations, LC/GC Ratio (%), Normalized Local Citations and Normalized Global Citations. The Normalized Local Citations and Normalized Global Citations metrics gauge the relative frequency of citations within the local database and across all databases, respectively. The LC/GC Ratio represents the percentage of local citations in comparison to global citations. The most influential article was by Shanmuganathan,<sup>[53]</sup> entitled "Behavioural Finance in an Era of artificial intelligence: Longitudinal case study of robo-advisors in investment decisions." with four local citations and thirty global citations and the local and global citation ratio is 13.33. Followed by next impactful article was by Ashta and

**Table 1: Top Influential Journals on AI and FI, Their Impact and Influence.**

Journal Name	Publisher	No. of Publications	Total Citations	SCImago Journal Rank	<i>h</i> -index	<i>g</i> -index	<i>m</i> -index
Expert systems with applications	Elsevier	7	367	1.873	6	7	0.462
Ieee access	Elsevier	12	259	0.926	6	12	1
Decision support systems	Elsevier	2	258	2.076	2	2	0.2
Journal of behavioral and experimental finance	Elsevier	5	135	1.242	5	5	1.25
Sustainability (switzerland)	MDPI AG	7	102	0.664	4	7	0.8
Business horizons	Elsevier Ltd	1	95	2.475	1	1	0.25
Journal of research in interactive marketing	Emerald Group Publishing Limited	2	85	2.833	2	2	0.333
Technological forecasting and social change	Elsevier	2	81	2.644	1	2	0.25
International journal	SAGE Publications Ltd	1	56	2.324	1	1	0.143
International journal of forecasting	Elsevier	1	44	1.972	1	1	0.25

**Table 2: Top Influential Authors on AI and FI, Their Impact and Influence.**

Authors	Affiliation	h-index	Total Citations	No. of Publications
Chang <i>et al.</i> <sup>[43]</sup>	Singapore Management University, Singapore.	1	243	1
Singh <i>et al.</i> <sup>[44]</sup>	Dongguk University, South Korea.	1	186	1
Randhawa <i>et al.</i> <sup>[45]</sup>	University of Malaya, Malaysia.	1	175	1
Chen <sup>[46]</sup>	National Taichung Institute of Technology, Taiwan.	1	128	1
I. Lee and Shin <sup>[47]</sup>	Western Illinois University, United States.	1	95	1
Gerlein <i>et al.</i> <sup>[48]</sup>	University of Ulster, United Kingdom.	1	90	1
Palmié <i>et al.</i> <sup>[49]</sup>	University of St. Gallen, Switzerland.	1	80	1
Pejić Bach <i>et al.</i> <sup>[50]</sup>	University of Zagreb, Croatia.	1	72	1
De Caigny <i>et al.</i> <sup>[51]</sup>	IÉSEG School of Management, France.	2	59	2
Ducas and Wilner <sup>[52]</sup>	Carleton University, Canada.	1	56	1

Herrmann<sup>[54]</sup> entitled "Artificial intelligence and fintech: An overview of opportunities and risks for banking, investments and microfinance." with three local citations and twenty-seven global citations with 11.11 local and global citations ratio and the third most impactful article was by Zhang *et al.*<sup>[55]</sup> entitled "Who do you choose? Comparing perceptions of human vs robo-advisor in the context of financial services." with three local citations and sixteen global citations with 18.75 local and global citations ratio.

### Most popular themes and conceptual structure

Table 4 highlights the top 20 most frequently used keywords, which provides insight into the most prominent topics covered in AI and FI literature. On top of the list with 106 appearances is the word "Artificial intelligence," followed by "Machine learning" (79), "Innovation" (52) and "Fintech" (41). This trend suggests that the majority of current works on AI and FI in the fields of finance and innovation take an empirical approach, with researchers focusing on the antecedents to research on artificial intelligence in financial innovation. More importantly, the thematic development of the keywords presented in six-time scales (1987-92, 1993-98, 1999-2004, 2005-10, 2011-16 and 2017-2022) demonstrates that empirical exposition on the factors determining AI and FI has sustained scholarly attention since 2016.

Examining the co-occurrence network of the most popular 62 keywords with a minimum number of 5 occurrences yielded the extracted articles' CS, which is shown in Figure 2. There are four clusters visible in this network. The first cluster is by far the largest at 36% of all of the most popular keywords followed by the second cluster is 24% and the third cluster is 21%, while the fourth cluster contains 19% of the top 237 keywords respectively.

The conceptual structure of AI and FI research comprises of 4 clusters (Red, Green, Blue and Yellow). The term "Financial service" is present in the first cluster (red color). Other terms

that form a strong network within the group include "learning systems," "deep learning," "fraud detection," "learning assessment," and "artificial intelligence (ai)," among others. The terms "artificial intelligence" remains central to its respective networks in the second cluster (green color) as well as it hold the biggest node which indicates it is the most frequent term in the dataset with the terms "fintech," "algorithm," "blockchain," "financial technology," "innovation," "network security," "cyber security," and the term "machine learning" remains vital to its respective networks in the third cluster (blue color) with the terms "financial market," "financial engineering," "electronic trading," "decision tree," "logistic regression" and finally the term "big data", is central to the fourth cluster (yellow color) that form a strong network within the group including "data mining," "forecasting," "decision support systems," "data analytics," "deep neural networks" "data science" and "predictive analytics" respectively. The co-occurrence analysis reveals the potential empirical dimensions that predominate in AI and FI research.

The study conducted from 1987 to 2022 on AI in Financial Innovation is concentrated in the identification of emerging themes such as learning algorithms, deep neural networks and natural language processing (red nodes). Similarly, the study in this period includes fintech and blockchain perceived as new innovation in the field of finance (green nodes); logistic regression and electronic trading (blue nodes) defining the upgradation of financial activities and decision support system and data analytics (yellow nodes) emerging as the new tools for better financial services.

### Future Scope of Research in Artificial Intelligence and Financial Innovation

The field of Artificial Intelligence (AI) and its application in financial innovation was already rapidly evolving. Given the pace

**Table 3: Most Frequently Cited Articles on AI and FI, Their Impact and Influence.**

Title	Author	Local Citations	Global Citations	LC/GC Ratio (%)	Normalized Local Citations	Normalized Global Citations	Year
"Behavioural finance in an era of artificial intelligence: Longitudinal case study of robo-advisors in investment decisions."	Shanmuganathan <sup>[53]</sup>	4	30	13.33	14.00	1.71	2020
"Artificial intelligence and fintech: An overview of opportunities and risks for banking, investments and microfinance."	Ashta and Herrmann <sup>[54]</sup>	3	27	11.11	10.88	2.59	2021
"Who do you choose? Comparing perceptions of human vs robo-advisor in the context of financial services."	Zhang <i>et al.</i> <sup>[55]</sup>	3	16	18.75	10.88	1.53	2021
"Digital servitization value co-creation framework for AI services: a research agenda for digital transformation in financial service ecosystems."	Manser Payne <i>et al.</i> <sup>[56]</sup>	2	39	5.13	7.25	3.74	2021
"Access to Finance for Artificial Intelligence Regulation in the Financial Services Industry."	J. Lee <sup>[57]</sup>	2	18	11.11	7.00	1.02	2020
"AI-based chatbot service for financial industry."	Okuda and Shoda <sup>[58]</sup>	2	45	4.44	5.20	1.78	2018
"Artificial Intelligence and Financial Services."	Pau <sup>[59]</sup>	2	12	16.67	1.00	1.00	1991
"Artificial intelligence, financial anxiety and cashier-less checkouts: a Saudi Arabian perspective."	Ghazwani <i>et al.</i> <sup>[60]</sup>	1	5	20.00	68.00	2.30	2022
"Exploring the paths to big data analytics implementation success in banking and financial service: an integrated approach."	Hajiheydari <i>et al.</i> <sup>[61]</sup>	1	5	20.00	3.63	0.48	2021
"Cultural relativity in consumers' rates of adoption of artificial intelligence."	Tubadji <i>et al.</i> <sup>[62]</sup>	1	8	12.50	3.63	0.77	2021



of technological advancements, it's likely that several areas would have seen significant progress and could offer exciting future research opportunities. After examining the conceptual structure of AI in Financial Innovation here are some potential future scopes of research in AI and financial innovation:

### **AI-Driven Personalized Financial Services**

AI can be leveraged to offer personalized financial products and services tailored to individual customers' needs and preferences. Future research may involve developing AI systems that better understand customers' financial goals, risk tolerance and behavior, leading to more effective personalized recommendations and financial planning.

### **AI in Algorithmic Trading and Investment Management**

AI has already had a significant impact on algorithmic trading and investment strategies. Future research may focus on developing advanced AI models that can analyze vast amounts of data in real-time, adapt to changing market conditions and improve the accuracy of investment decisions.

### **AI for Fraud Detection and Cybersecurity in Finance**

As financial transactions move increasingly to digital platforms, the risk of fraud and cyber-attacks also grows. Future research might involve enhancing AI-driven fraud detection systems by using more sophisticated techniques, such as anomaly detection, behavioral biometrics and deep learning algorithms.

### **AI in Regulatory Technology (FinTech)**

With increasing regulatory requirements in the financial sector, there's potential for AI-driven FinTech solutions to automate compliance processes, monitor transactions for suspicious activities and ensure adherence to changing regulations.

### **AI-Powered Chatbots and Decision Support Systems**

The integration of AI-powered chatbots into customer service in the financial industry is likely to grow. Future research could explore the development of chatbots with improved natural language understanding and contextual awareness to provide more personalized and efficient customer support.

### **Natural Language Processing (NLP) for Financial Documents**

NLP can play a crucial role in analyzing and extracting insights from vast amounts of unstructured financial data, such as earnings reports, news articles and SEC filings. Future research may focus on developing more advanced NLP algorithms for financial sentiment analysis and event prediction.

### **AI-Driven Robo-Advisors**

Robo-advisors are digital platforms that provide automated, algorithm-driven financial planning and investment services. The future scope of research in this area could involve enhancing the sophistication of robo-advisors, incorporating more complex financial instruments and improving their ability to provide personalized investment strategies based on individual goals and risk profiles.

### **AI and Quantum Computing in Finance**

As quantum computing technology advances, there could be exciting opportunities to apply quantum computing algorithms to financial modeling, risk analysis and optimization problems. Research in this area could lead to revolutionary advancements in financial innovation.

### **Contribution of the study**

After going through systematic approaches of review on the impact of AI on financial Innovation provides following Contribution of the study.

### **Data expansion (Big Data)**

The explosion of the big data market has had a major impact on the Banking industry due to the changing expectations of customers. Customers now interact with their banks on a more digital level and in addition to the traditional structured data e.g. transactional data, organizations nowadays collect large volumes of unstructured data such as emails, text and voice messages, images and videos via their customer service, social media platforms and other mediums of data collection. Leveraging on big data, banks are now able to offer more personalized services. Banking organizations are using a 360-degree view of the customer's interaction with the brand, including basic personal data, transaction history and social media interactions to inform their decision-making processes.

### **Availability of infrastructure (Fast computers, hardware, software, Cloud)**

The explosion of cloud technology as well as high computational resources and infrastructure availability, allows for quick processing of large data at lower costs and efficiency in scalability. This means organizations are ready to leverage AI now, more than ever.

### **Regulatory requirements**

Banks are under a lot of scrutiny from regulators to provide accurate reports in a timely manner, to meet their regulatory obligations. Regulatory compliance processes require the collection of data from various source systems. AI-driven solutions offer a chance to address some of the challenges in today's financial systems by automating the data collection processes, improving

the speed and quality of decisions and enhancing the organization's readiness to meet regulatory compliance obligations. Continued development of AI will radically transform the front and back-office operations of financial institutions. The AI expansion will also require adjustments to longstanding regulations and major changes to the current structure of global financial markets. This shift is an opportunity for compliance teams to strategically invest in new technologies in order to enable banks to become more future-ready.

## Competition

Banks are constantly competing with their peers in the industry and more recently with FinTechs, to provide the best services to their clients. Technology has become a differentiator in this space as organizations take advantage of available cutting-edge technologies to harvest the vast amount of data they possess. As a result, banks are using AI to optimize current service offerings, take new offerings to market and provide a more personalized experience for their customers.

## Limitations of the Study

One limitation of the study is its sole dependence on the Scopus database. Researchers can obtain a deeper grasp of the topic and fill in any knowledge gaps by broadening the scope of their investigation. Despite the limitations, research in Artificial Intelligence and Financial Innovation offers tremendous potential for transforming the financial industry. AI-driven solutions have the capacity to improve efficiency, reduce costs, enhance risk management and deliver more personalized financial services. By addressing the future scopes mentioned above, researchers and industry stakeholders can unlock the full potential of AI in finance responsibly.

## CONCLUSION

To examine the role of AI in Financial innovation research from 1987 to 2022, the study scrutinizes 327 papers sourced from 963 outlets. The findings reveal a surge in attention and publications related to AI in Financial innovation, with 78% of the papers considered in this analysis were published after 2018 which indicates that this field is emerging. The top 10 contributors to AI in Financial innovation research are identified based on their citations, with Ray M. Chang leading the list, followed by Sourabh Singh and Kuldeep Randhawa. The study designates 'Expert Systems with applications' and the 'IEEE Access' as the most prominent sources in AI in Financial innovation research, closely trailed by the journal 'Decision support systems' and 'Journal of behavioral and experimental finance'. Notable articles cited in the research of AI in Financial innovation include "Behavioural finance in an era of artificial intelligence: Longitudinal case study of robo-advisors in investment decisions." Followed by "Artificial intelligence and fintech: An overview of opportunities and risks for banking, investments and microfinance." and "Who do you

choose? Comparing perceptions of human vs robo-advisor in the context of financial services." The analysis identifies "Financial service", "artificial intelligence", "machine learning" and "big data" as the most frequently used terms, shedding light on prevalent linkages in AI in Financial innovation studies reflecting the growing interest among scholars and professionals in this field. To ensure the successful integration of AI, collaboration among researchers, financial institutions, policymakers and regulators is essential. Open communication and continuous monitoring of AI applications will help identify and rectify potential issues promptly. Ethical considerations must remain at the forefront of AI development, emphasizing fairness, transparency and accountability in financial decision-making processes.

As the technology continues to evolve, researchers must remain vigilant, anticipating and addressing new challenges that may arise. The responsible use of AI in financial innovation can lead to a more inclusive, efficient and secure financial ecosystem that benefits both financial institutions and their customers.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## REFERENCES

- Njegovanović A. Artificial Intelligence: Financial Trading and Neurology of Decision. *Financ Mark Institutions Risks* [Internet]. 2018;58-68. Available from: <http://armgpub.lishing.sumdu.edu.ua/journals/fmir/volume-2-issue-2/article-5/>
- Bughin J, Hazan E, Ramaswamy S, Chui M, Allas T, Dahlstrom P, et al. Artificial intelligence: the next digital frontier? *McKinsey Glob Inst*. 2017;
- Mohanandaram T, Vetrivel SC, Prakash N. Fintech and Its Effect on India's Changing Financial Landscape: an Exploratory Study. *Int J Excl Manag Res*. 2020;10(8):1-7.
- Kaur G. Trust the Machine and Embrace Artificial Intelligence (AI) to Combat Money Laundering Activities. In: *Computational Intelligence for Modern Business Systems Disruptive Technologies and Digital Transformations for Society 50* [Internet]. 2024. p. 63-81. Available from: [https://link.springer.com/10.1007/978-981-99-5354-7\\_4](https://link.springer.com/10.1007/978-981-99-5354-7_4)
- Georgiev J. Setting the scene: digital technologies in the financial sector. *JKG Advisory*. 2018.
- Sharma S. 10 Artificial Intelligence Applications Revolutionizing Financial Services [Internet]. *DataDriveninvestor*. 2019 [cited 2022 Aug 4]. Available from: <https://www.datadriveninvestor.com/2019/07/08/10-artificial-intelligence-applications-revolutionizing-financial-services/#>
- Iman N, Nugroho SS, Junarsin E, Pelawi RY. Is technology truly improving the customer experience? Analysing the intention to use open banking in Indonesia. *Int J Bank Mark* [Internet]. 2023 Dec 1;41(7):1521-49. Available from: <https://www.emerald.com/insight/content/doi/10.1108/IJBM-09-2022-0427/full/html>
- Amery Annabelle. The Increasing Role of Artificial Intelligence (AI) in Financial Services [Internet]. *Become*. 2018 [cited 2022 Aug 4]. Available from: <https://www.become.co/blog/the-increasing-role-of-artificial-intelligence-ai-in-financial-services/>
- Danielsson J, Macrae R, Uthemann A. Artificial Intelligence and Systemic Risk. *SSRN Electron J* [Internet]. 2019; Available from: <https://www.ssrn.com/abstract=3410948>
- Han H, Shiwakoti RK, Jarvis R, Mordi C, Botchie D. Accounting and auditing with blockchain technology and artificial intelligence: A literature review. *Int J Account Inf Syst* [Internet]. 2023 Mar ;48:100598. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1467089522000501>
- Martin K, Waldman A. Are Algorithmic Decisions Legitimate? The Effect of Process and Outcomes on Perceptions of Legitimacy of AI Decisions. *J Bus Ethics* [Internet]. 2023;183(3):653-70. Available from: <https://link.springer.com/10.1007/s10551-021-05032-7>
- Schroer A. 25 Examples of AI In Finance 2022 [Internet]. *Built in*. 2022 [cited 2022 Aug 4]. Available from: <https://builtin.com/artificial-intelligence/ai-finance-banking-applications-companies>
- Berns M. AI: a promising innovation for the German financial sector. *PwC*. 2022.
- Campbell C, Sands S, Ferraro C, Tsao H-Y (Jody), Mavrommatis A. From data to action: How marketers can leverage AI. *Bus Horiz*. 2020;63(2):227-43.
- OECD. Artificial Intelligence, Machine Learning and Big Data in Finance: Opportunities, Challenges and Implications for Policy Makers [Internet]. *OECD business and finance outlook 2020 : sustainable and resilient finance*. 2021. Available from: <https://www.o>

- ecd.org/finance/financial-markets/Artificial-intelligence-machine-learning-big-data-in-finance.pdf
16. Abad-Segura E, González-Zamar MD, López-Meneses E, Vázquez-Cano E. Financial Technology: Review of trends, approaches and management. *Mathematics*. 2020;8(6):1-36.
  17. Blanco-Mesa F, Merigó JM, Gil-Lafuente AM. Fuzzy decision making: A bibliometric-based review. *J Intell Fuzzy Syst*. 2017;32(3):2033-50.
  18. Donthu N, Kumar S, Pattnaik D. Forty-five years of Journal of Business Research: A bibliometric analysis. *J Bus Res*. 2020;109:1-14.
  19. Mas-Tur A, Modak NM, Merigó JM, Roig-Tierno N, Geraci M, Capecchi V. Half a century of Quality and Quantity: a bibliometric review. *Qual Quant* [Internet]. 2019;53(2):981-1020. Available from: <http://link.springer.com/10.1007/s11135-018-0799-1>
  20. Merigó JM, Muller C, Modak NM, Laengle S. Research in Production and Operations Management: A University-Based Bibliometric Analysis. *Glob J Flex Syst Manag* [Internet]. 2019;20(1):1-29. Available from: <http://link.springer.com/10.1007/s40171-018-0201-0>
  21. Pattnaik D, Kumar S, Vashishtha A. Research on trade credit - a systematic review and bibliometric analysis. *Qual Res Financ Mark*. 2020;12(4):367-90.
  22. Small H. Co-citation in the scientific literature: A new measure of the relationship between two documents. *J Am Soc Inf Sci* [Internet]. 1973 Jul 1 [cited 2022 Aug 8];24(4): 265-9. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1002/asi.4630240406>
  23. Tsay M-Y. Citation analysis of Ted Nelson's works and his influence on hypertext concept. *Scientometrics*. 2009;79(3):451-72.
  24. Ding Y, Cronin B. Popular and/or prestigious? Measures of scholarly esteem. *Inf Process Manag*. 2011;47(1):80-96.
  25. Hu K, Wu H, Qi K, Yu J, Yang S, Yu T, et al. A domain keyword analysis approach extending Term Frequency-Keyword Active Index with Google Word2Vec model. *Scientometrics*. 2018;114(3):1031-68.
  26. Castriotta M, Loi M, Marku E, Naitana L. What's in a name? Exploring the conceptual structure of emerging organizations. *Scientometrics*. 2019;118(2):407-37.
  27. Bastian M, Heymann S, Jacomy M. Gephi: An Open Source Software for Exploring and Manipulating Networks. *Proc Third Int ICWSM Conf*. 2009;361-2.
  28. Tranfield D, Denyer D, Smart P. Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *Br J Manag* [Internet]. 2003;14(3):207-22. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/1467-8551.00375>
  29. Zupic I, Čater T. Bibliometric Methods in Management and Organization. *Organ Res Methods* [Internet]. 2015;18(3):429-72. Available from: <http://journals.sagepub.com/doi/10.1177/1094428114562629>
  30. Jena JR, Panigrahi RR, Shrivastava AK. A bibliometric analysis on financial engineering studies. *Int J Financ Eng*. 2023;10(02).
  31. Noman AA, Akter UH, Pranto TH, Bahalul AKM. Machine Learning and Artificial Intelligence in Circular Economy : A Bibliometric Analysis and Systematic Literature Review. 2022;6(2):13-40.
  32. Fisch C, Block J. Six tips for your (systematic) literature review in business and management research. *Manag Rev Q* [Internet]. 2018;68(2):103-6. Available from: <http://link.springer.com/10.1007/s11301-018-0142-x>
  33. Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM. How to conduct a bibliometric analysis: An overview and guidelines. *J Bus Res* [Internet]. 2021;133:285-96. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0148296321003155>
  34. Jena JR, Biswal SK, Shrivastava AK, Panigrahi RR. A bibliographic overview of financial engineering in the emerging financial market. *Int J Syst Assur Eng Manag* [Internet]. 2023;14(6):2048-65. Available from: <https://link.springer.com/10.1007/s13198-023-02123-8>
  35. LAWANI SM. Bibliometrics: Its Theoretical Foundations, Methods and Applications. *Libri* [Internet]. 1981;31(1). Available from: <https://www.degruyter.com/document/doi/10.1515/libr.1981.31.1.294/html>
  36. Mhlanga D. Industry 4.0 in Finance: The Impact of Artificial Intelligence (AI) on Digital Financial Inclusion. *Int J Financ Stud* [Internet]. 2020;8(3):45. Available from: <https://www.mdpi.com/2227-7072/8/3/45>
  37. Nerur SP, Rasheed AA, Natarajan V. The intellectual structure of the strategic management field: an author co-citation analysis. *Strateg Manag J* [Internet]. 2008;29(3):319-36. Available from: <https://onlinelibrary.wiley.com/doi/10.1002/smj.659>
  38. Broadus RN. Toward a definition of "bibliometrics." *Scientometrics* [Internet]. 1987;12(5-6):373-9. Available from: <http://link.springer.com/10.1007/BF02016680>
  39. Pritchard A. Statistical bibliography or bibliometrics? *J Doc*. 1969;25(4):348-9.
  40. Acedo FJ, Barroso C, Casanueva C, Galan JL. Co-Authorship in Management and Organizational Studies: An Empirical and Network Analysis\*. *J Manag Stud* [Internet]. 2006;43(5):957-83. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/j.1467-6486.2006.00625.x>
  41. Giudici P, Centurelli M, Turchetta S. Artificial Intelligence risk measurement. *Expert Syst Appl*. 2024;235:121220.
  42. Babina T, Fedyk A, He A, Hodson J. Artificial intelligence, firm growth and product innovation. *J financ econ*. 2024;151:103745.
  43. Chang RM, Kauffman RJ, Kwon Y. Understanding the paradigm shift to computational social science in the presence of big data. *Decis Support Syst* [Internet]. 2014;63:67-80. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0167923613002212>
  44. Singh S, Sharma PK, Yoon B, Shojafar M, Cho GH, Ra I-H. Convergence of blockchain and artificial intelligence in IoT network for the sustainable smart city. *Sustain Cities Soc* [Internet]. 2020;63:102364. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S2210670720305850>
  45. Randhawa K, Loo CK, Seera M, Lim CP, Nandi AK. Credit Card Fraud Detection Using AdaBoost and Majority Voting. *IEEE Access* [Internet]. 2018;6:14277-84. Available from: <https://ieeexplore.ieee.org/document/8292883/>
  46. Chen M-Y. Predicting corporate financial distress based on integration of decision tree classification and logistic regression. *Expert Syst Appl* [Internet]. 2011;38(9):11261-72. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0957417411003976>
  47. Lee I, Shin YJ. Machine learning for enterprises: Applications, algorithm selection and challenges. *Bus Horiz* [Internet]. 2020;63(2):157-70. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0007681319301521>
  48. Gerlein EA, McGinnity M, Belatreche A, Coleman S. Evaluating machine learning classification for financial trading: An empirical approach. *Expert Syst Appl* [Internet]. 2016;54:193-207. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0957417416000282>
  49. Palmiè M, Wincent J, Parida V, Caglar U. The evolution of the financial technology ecosystem: An introduction and agenda for future research on disruptive innovations in ecosystems. *Technol Forecast Soc Change* [Internet]. 2020;151:119779. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0040162519310595>
  50. Pejić Bach M, Krstić Ž, Seljan S, Turulja L. Text Mining for Big Data Analysis in Financial Sector: A Literature Review. *Sustainability* [Internet]. 2019;11(5):1277. Available from: <https://www.mdpi.com/2071-1050/11/5/1277>
  51. De Caigny A, Coussement K, De Bock KW, Lessmann S. Incorporating textual information in customer churn prediction models based on a convolutional neural network. *Int J Forecast* [Internet]. 2020;36(4):1563-78. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0169207019301499>
  52. Ducas E, Wilner A. The security and financial implications of blockchain technologies: Regulating emerging technologies in Canada. *Int J Canada's J Glob Policy Anal* [Internet]. 2017;72(4):538-62. Available from: <http://journals.sagepub.com/doi/10.1177/0020702017741909>
  53. Shanmuganathan M. Behavioural finance in an era of artificial intelligence: Longitudinal case study of robo-advisors in investment decisions. *J Behav Exp Financ* [Internet]. 2020;27:100297. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S221463501930214X>
  54. Ashta A, Herrmann H. Artificial intelligence and fintech: An overview of opportunities and risks for banking, investments and microfinance. *Strateg Chang* [Internet]. 2021;30(3):211-22. Available from: <https://onlinelibrary.wiley.com/doi/10.1002/jsc.2404>
  55. Zhang L, Pentina I, Fan Y. Who do you choose? Comparing perceptions of human vs robo-advisor in the context of financial services. *J Serv Mark* [Internet]. 2021;35(5):634-46. Available from: <https://www.emerald.com/insight/content/doi/10.1108/JSM-05-2020-0162/full/html>
  56. Manser Payne EH, Dahl AJ, Peltier J. Digital servitization value co-creation framework for AI services: a research agenda for digital transformation in financial service ecosystems. *J Res Interact Mark* [Internet]. 2021;15(2):200-22. Available from: <https://www.emerald.com/insight/content/doi/10.1108/JRIM-12-2020-0252/full/html>
  57. Lee J. Access to Finance for Artificial Intelligence Regulation in the Financial Services Industry. *Eur Bus Organ Law Rev* [Internet]. 2020;21(4):731-57. Available from: <http://link.springer.com/10.1007/s40804-020-00200-0>
  58. Okuda T, Shoda S. AI-based chatbot service for financial industry. *Fujitsu Sci Tech J*. 2018;54(2):4-8.
  59. Pau LF. Artificial intelligence and financial services. *IEEE Trans Knowl Data Eng* [Internet]. 1991;3(2):137-48. Available from: <http://ieeexplore.ieee.org/document/87994/>
  60. Ghazwani S, van Esch P, Cui Y (Gina), Gala P. Artificial intelligence, financial anxiety and cashier-less checkouts: a Saudi Arabian perspective. *Int J Bank Mark* [Internet]. 2022;40(6):1200-16. Available from: <https://www.emerald.com/insight/content/doi/10.1108/IJBM-09-2021-0444/full/html>
  61. Hajiheydari N, Delgosha MS, Wang Y, Olya H. Exploring the paths to big data analytics implementation success in banking and financial service: an integrated approach. *Ind Manag Data Syst* [Internet]. 2021;121(12):2498-529. Available from: <https://www.emerald.com/insight/content/doi/10.1108/IMDS-04-2021-0209/full/html>
  62. Tubadji A, Denney T, Webber DJ. Cultural relativity in consumers' rates of adoption of artificial intelligence. *Econ Inq* [Internet]. 2021;59(3):1234-51. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/ecin.12978>

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