# Future Trend of Artificial Intelligence and Stock Market: A Comprehensive Bibliometric Analysis

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**ABSTRACT**

Artificial intelligence (AI) has revolutionized stock market research, offering innovative solutions for predictive modeling, algorithmic trading, and financial decision-making. Despite significant advancements, the integration of AI in stock markets remains underexplored in terms of evolving trends, collaborative research dynamics, and practical applications. Existing studies often focus on isolated techniques or case-specific applications, leaving a gap in understanding the broader landscape of AI's role in reshaping financial systems. This study addresses these gaps through a bibliometric analysis of publications indexed in Web of Science (WoS) and Scopus from 1980 to early 2025, with a detailed focus on contributions between 2022 and 2023. The research seeks to answer three key questions: What are the emerging trends in AI-driven stock market research? Which authors, institutions, and countries lead in this domain? What are the most cited studies, and how do they influence the field? By using tools like VOSviewer, this study examines keyword co-occurrences, citation networks, and publication trends. The findings reveal a rapid shift towards hybrid models, leveraging AI techniques like machine learning and deep learning, coupled with sentiment analysis and real-time adaptive systems. While challenges such as data quality and ethical considerations persist, the study underscores AI's transformative potential, highlighting the need for interdisciplinary collaboration and innovative approaches to address these challenges.

**Keywords:** Algorithmic Trading, Artificial Intelligence, Bibliometric, Future Trend, Stock Market.
**JEL Classifications:** C89, D53, G10, G17, O33

## 1. INTRODUCTION

The stock market, an emblem of economic activity and growth, has long attracted individuals and institutions seeking wealth creation and financial security. It operates as a dynamic platform where shares of publicly traded companies are bought and sold (Aldhyani and Alzahrani, 2022), reflecting the intricate interplay of market sentiment, corporate performance, and macroeconomic factors (Chen et al., 2021; Xu and Zhao, 2022). However, the complexity and volatility inherent in stock markets make investment decisions a daunting task, laden with risks and uncertainties (Lee, 2020; Fassas and Siriopoulos, 2021).

In this study context, the advent of Artificial Intelligence (AI) has emerged as a transformative tool, reshaping how investors approach the market and make decisions.

According to Ferreira et al. (2021) and Mokhtari et al. (2021), the integration of Artificial Intelligence (AI) into the stock market has emerged as a pivotal development in financial forecasting and trading strategies. According to Gandhmal and Kumar (2019), traditional methods of stock market prediction often struggle with the complexities and volatilities inherent in financial markets, while AI technologies provide innovative solutions that enhance predictive accuracy and decision-making efficiency.

AI's application in stock market forecasting encompasses various methodologies, including machine learning algorithms, deep learning models, and natural language processing techniques. These technologies allow for the analysis of vast datasets, enabling investors to discern patterns and predict stock movements with greater precision (Mhlongo, 2024). For instance, studies have demonstrated that deep learning models, such as Long Short-Term Memory (LSTM) networks, can significantly improve stock price predictions by effectively capturing temporal dependencies in historical data (Sherstinsky, 2020). Moreover, the utilization of AI-driven robo-advisors has gained traction, as these systems leverage big data analytics to optimize investment strategies and enhance portfolio management (Tsai & Chen, 2022).

The performance of AI in the stock market has been notably superior to that of traditional forecasting methods. Research indicates that AI-enhanced trading strategies can yield better returns, particularly in volatile market conditions (Ho et al., 2022). The ability of AI to process and analyse information at unprecedented speeds allows for real-time decision-making, which is crucial in the fast-paced environment of stock trading. Furthermore, the incorporation of sentiment analysis, derived from social media and news sources, has proven effective in predicting market trends, as public sentiment often influences stock prices (Mehta et al., 2021). This multifaceted approach to stock market analysis not only improves prediction accuracy but also empowers individual investors, who may lack extensive market knowledge, to make informed decisions (Chopra & Sharma, 2021).

In the modern technology and the complexity of financial data, the advanced methodologies that can efficiently process vast amounts of information in stock market while minimizing input requirements (Rouf et al., 2021; Kumbure et al., 2022). According to the study by Kansal & Kumar (2019), AI proposing a trend in algorithm, such as the Cuckoo Neural for Financial Market (CN_FM), which combines Cuckoo Search with a Feed Forward Back Propagation Neural Network (FFBPNN). The modern technology enhances forecasting accuracy by optimizing feature extraction, thereby demonstrating the potential of AI to streamline stock market analysis (Kansal & Kumar, 2019).

The increasing integration of AI in stock market investment strategies has garnered significant scholarly and practical attention (Bisht et al., 2022; El Hajj and Hammoud, 2023). Bibliometric analyses of this domain reveal an exponential growth in publications, reflecting the surge in interest from researchers, practitioners, and policymakers alike (Ingale and Paluri, 2022; Dhingra and Yadav, 2024). AI technologies, encompassing machine learning algorithms, predictive analytics, and natural language processing, are being explored to enhance decision-making by analysing vast amounts of data and predicting market trends (Ma and Sun, 2020; Zulkifley et al., 2023; Salgotra et al., 2024).

This paper conducts a comprehensive bibliometric explore of AI role in stock market analysis using the data from Web of Science (WoS) and Scopus from 1980 to early 2025. Moreover, this study also particularly over the last 2 years (2022–2023). Thus, the are few objectives explores:

i) Analyse the future trend of AI and stock market using data from Web of Science and Scopus from year 1980 to 2025.
ii) Evaluate the top 10 most frequently used author keywords of AI and stock market, focusing between 2022–2023.
iii) Identify the 10 highly cited publications on AI and stock market since 1980 to 2025.
iv) Explore the VOSviewer mapping the interconnected keywords and terms in AI and stock market.

## 2. LITERATURE REVIEW

Artificial Intelligence (AI) has become a transformative force across various domains, with a growing body of literature exploring its applications in finance, sustainability, and broader economic and social contexts. AI role in reshaping financial practices is well-documented, with studies emphasising its potential to enhance efficiency, decision-making, and risk management. Jena et al. (2024) provides an in-depth bibliometric analysis, identifying key thematic areas such as risk management and algorithmic trading. The study also highlights research gaps in regulatory challenges and ethical considerations, signalling the need for more comprehensive frameworks to guide AI integration in finance. Complementing this, Nica (2024) investigates the intersection of fuzzy logic and AI in financial analysis, showcasing their combined potential to address the complexity of modern financial markets. By tracing the evolution of mathematical models, Nica underscores the importance of innovative approaches to financial decision-making.

In a similar vein, Janková (2021) explores the use of machine learning in financial markets, focusing on improving predictive accuracy and operational efficiency. This aligns with Jena's findings on algorithmic trading while offering a more specific lens on predictive analytics. Meanwhile, Romero-Carazas et al. (2024) delves into forensic auditing, demonstrating how AI enhances fraud detection and risk assessment. The study highlights the evolving nature of auditing practices as they adapt to technological advancements. Collectively, these studies underscore AI transformative impact on financial systems, with overlaps in themes of efficiency, decision-making, and risk management, while also addressing unique aspects such as fuzzy logic and forensic auditing AI applications in sustainability have also garnered significant attention, particularly in advancing circular economy (CE) practices and achieving Sustainable Development Goals (SDGs). Noman et al. (2022) analyse AI role in CE, focusing on resource optimisation and waste minimisation through practices like remanufacturing. Their findings emphasise AI capacity to drive sustainability by enhancing resource utilisation.

Expanding on this, Ogrean (2023) explores AI contribution to sustainable business practices, identifying key research trends that align AI initiatives with SDGs. Both studies converge on the theme of sustainability but offer distinct perspectives—Noman et al. through the lens of CE and resource reuse, and Ogrean through broader business strategies. Qin et al. (2023) further explore AI potential to foster economic growth while supporting

sustainability initiatives. Their work underscores the importance of strategic policymaking to leverage AI technologies for societal advancement. Collectively, these studies illustrate AI critical role in aligning technological innovation with sustainable development objectives, offering pathways to address global challenges.

AI impact extends to business and entrepreneurship, where it fosters innovation and operational efficiency. Boateng (2024) maps the research landscape of AI in entrepreneurship, highlighting its role in driving innovation and economic growth. The study consolidates fragmented insights and calls for a more cohesive understanding of AI influence in this domain. Similarly, Bawack et al. (2022) focus on AI in e-commerce, revealing its transformative role in enhancing personalisation and knowledge management through technologies like recommender systems. This aligns with Han et al. (2021), who explore AI applications in B2B marketing, synthesising findings from 221 articles to highlight AI growing importance in business practices. These studies collectively emphasise the dynamic nature of AI in business, with overlapping themes of innovation, operational efficiency, and personalisation. However, each provides a unique angle, such as Boateng (2024) on entrepreneurship, then, Bawack et al. (2022), on e-commerce, and Han et al. (2021) on B2B marketing using AI technology.

Beyond finance, sustainability, and business, AI is increasingly influencing fields like behavioural economics and social sciences. Aoujil et al. (2023) explores AI intersection with behavioural economics, identifying emerging themes such as AI-based nudging and prospect theory in behavioural finance. The study emphasises the need for collaboration between AI experts and behavioural economists to address ethical concerns surrounding AI's influence on decision-making. Meanwhile, Bircan and Salah (2022) examine AI application in social sciences, revealing its potential to blend big data analytics with traditional methodologies. Their findings highlight how AI offers fresh insights into social phenomena, expanding the analytical toolkit available to social scientists. Additionally, Ruiz-Real et al. (2020) and Yang et al. (2022) contribute to the discussion by identifying emerging trends in AI research within business and economics. These studies emphasise AI's role as a catalyst for innovation and strategic decision-making, reinforcing its transformative potential across disciplines.

The reviewed studies collectively underscore AI's transformative impact across diverse domains, with recurring themes of innovation, efficiency, and sustainability. While overlaps exist, such as in financial practices and sustainability, each study offers unique insights, enriching the broader understanding of AI's applications. The identified research gaps, particularly in ethical considerations, regulatory challenges, and interdisciplinary collaboration, provide fertile ground for future exploration. By synthesising these findings, this review highlights the multifaceted nature of AI, demonstrating its critical role in shaping contemporary practices and addressing global challenges.

## 3. METHODOLOGY

Bibliometrics offers a powerful way to understand the academic world by analysing patterns in publications, citations, and other related metrics. A key purpose of bibliometric analysis is to evaluate the impact of research. By examining citation trends, it becomes possible to see which papers, authors, or journals hold significant influence within a specific field. According to Khan et al. (2022) and Mohamad et al. (2024a), bibliometric tools help identify emerging topics and shifts in academic focus by mapping keywords and analysing co-citation networks. These insights can guide researchers toward areas ripe for exploration or collaboration, ensuring their work remains relevant and forward-looking (Marzi et al., 2024; Mohamad & Ab-Rahim, 2025). Moreover, bibliometric methods are more than just a way to crunch numbers, as they are a lens through which the ever-evolving world of academic research can be better understood (Handoyo, 2024; Wei et al., 2025). By quantifying influence, identifying trends, and guiding strategic decisions, bibliometrics empowers researchers and institutions to create meaningful, impactful contributions to their fields and society at large (Mohamad et al., 2024b).

This bibliometric study began with data collection from two major databases, Scopus and Web of Science (WoS), which are widely recognised as comprehensive sources of peer-reviewed research literature. Both databases were accessed using institutional subscriptions to ensure high-quality data retrieval, then analyse using the ScientoPy and VOSviewer. According to Ruiz-Rosero et al. (2019), ScientoPy was utilised as the primary software platform for analysing and managing the study's top topics, authors, countries, and other related publications. ScientoPy, a free and open-source Python-based scientometric analysis tool, ensures unbiased processing of individual publications through its robust pre-processing capabilities (Ruiz-Rosero et al., 2019; Li et al., 2021). VOSviewer is widely recognized for its ability to visually represent relationships among keywords, themes, and authors in a network format, offering a clear and credible depiction of the interconnections across research topics (Wong, 2018; Mohamad et al., 2024a). The search query: TITLE-ABS-KEY ("Artificial intelligence" OR "AI" AND "stock market" OR "Algorithmic Trading") AND (LIMIT-TO (DOCTYPE, "ar")). This study performed on 30 November 2024 employing search for "Artificial Intelligence" or "AI" and "stock market" OR "algorithmic trading" with only limited to article journal only." There is also recorded an early article publication for 2025 (published in press) included as the search query was during end of the year 2024. The retrieved dataset comprised bibliographic details of articles, including authors, titles, keywords, abstracts, and citations.

### 3.1. Pre-processing of Retrieved Datasets

Table 1 shown the pre-processing of the raw data involved cleaning duplicate entries and ensuring consistency in terms and keywords to enhance the reliability of the analysis. As a result, 918 documents were initially retrieved, with 416 (45.3%) from WoS and 502 (54.7%) from Scopus. To enhance the accuracy of the analysis, duplicate removal was performed. Atotal of 85 duplicate documents (9.3% of the dataset) were identified, with all duplicates removed from Scopus (16.9%) while maintaining the integrity of the WoS entries. Among these duplicates, 60 records (70.6%) were identified as having differing citation counts, highlighting variations in metadata representation between databases. After the deduplication process, the final dataset consisted of 833 unique

**Table 1: Pre-processing dataset**

| Data pre-processing | Information | Number | % |
|---|---|---|---|
| Initial dataset stage | Total raw dataset | 918 | - |
| | Loaded papers from WoS (article only) | 416 | 45.30 |
| | Loaded papers from Scopus (article only) | 502 | 54.70 |
| Duplicates removing stage | Duplicated papers found | 85 | 9.30 |
| | Removed duplicated papers from WoS | 0 | - |
| | Removed duplicated papers from Scopus | 85 | 16.90 |
| | Duplicated documents with different cited by | 60 | 70.60 |
| Final stage (clean dataset) | Total papers after removing duplicate articles | 833 | - |
| | Final selected articles from WoS | 416 | 49.90 |

**Figure 1:** Top 10 most frequently used author keywords



documents, with 416 papers (49.9%) from WoS and 417 papers (50.1%) from Scopus, ensuring a balanced representation from both sources.

The distribution of document types was also analysed, with the dataset exclusively comprising articles type only. Based on the research search focus, there are no reviews, conference papers, proceedings, or articles in press were included, aligning with the study's focus on peer-reviewed journal articles. By eliminating duplicates using ScientoPy, extracts a consolidating data from these leading bibliographic sources, the final dataset provided a clean dataset that for this bibliometric and scientometric analyses (Ruiz-Rosero et al., 2019; Nikolić et al., 2024). This methodological approach ensured that the results are reliable, representative, and free from redundancy, facilitating accurate insights into the intersection of Artificial Intelligence (AI), stock market or algorithmic trading.

## 4. RESULTS AND DISCUSSION

### 4.1. Top 10 Most Frequently used Author Keywords: Research AI and Stock Market

The Figure 1 provides a comprehensive analysis of the top 10 most frequently used author keywords related to "AI" and "Stock Market," along with their publication trends categorized into two distinct periods, which are before 2022 (blue) and between 2022–2023 (orange). The graph visually highlights both the cumulative research output and the growth percentages of publications for each keyword over the 2-year period. At the top of the list is algorithmic trading, which dominates the research landscape in terms of total publications. However, the percentage of new documents published between 2022 and 2023 stands at 27%, indicating steady growth rather than explosive recent interest. This reflects the established nature of algorithmic trading as a critical application of AI in financial markets. Researchers continue to explore advancements in automated systems that enable faster, more accurate trade execution, while addressing challenges such as market volatility and risk management.

The term Artificial Intelligence follows closely, showing a significant 42% growth in the last 2 years. This sharp increase
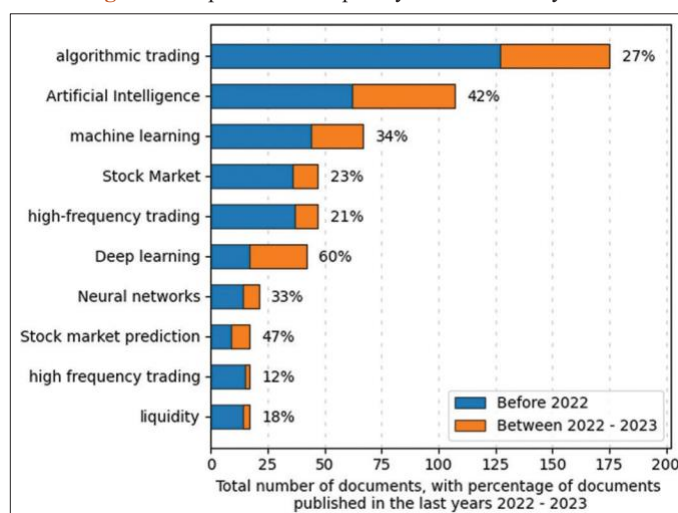
highlights the broadening role of AI across various domains within financial research, including predictive analytics, portfolio optimisation, and high-frequency trading. The rising publication count suggests that AI is not only a foundational concept but also a rapidly evolving tool for tackling complex challenges in the stock market. The growth may also reflect AI's increasing accessibility, driven by advancements in computational power and algorithm development. Machine learning also holds a prominent position in the chart, recording a 34% growth in recent publications. As a subfield of AI, machine learning has proven essential for stock market forecasting, risk assessment, and anomaly detection. Researchers are increasingly focused on enhancing model efficiency, ensuring robustness, and addressing real-time market fluctuations.

The keyword Deep learning stands out with the highest growth rate of 60% among the listed terms. This remarkable surge demonstrates the growing adoption of deep learning techniques—particularly neural networks and advanced frameworks like recurrent neural networks (RNNs) and convolutional neural networks (CNNs)—to solve financial problems. Deep learning is being increasingly applied to areas such as stock price prediction, sentiment analysis using financial news, and portfolio management. Neural networks similarly display considerable growth at 33%, reinforcing the role of this technique in modern AI research. Neural networks serve as the backbone for deep learning approaches, enabling the development of predictive models that account for non-linear relationships and complex financial dynamics. Their adaptability and accuracy make them a popular choice for stock market prediction, particularly in identifying subtle trends that traditional statistical models might overlook.

The terms Stock Market and Stock Market Prediction both reflect consistent contributions, with growth rates of 23% and 47%, respectively. While "Stock Market" serves as a broad descriptor of research activity, the more focused term "Stock Market Prediction" highlights the application of AI in forecasting future stock prices and trends. The significant growth in this area reflects the increasing demand for reliable, data-driven tools to help investors and analysts navigate market uncertainties.

## 4.2. Top 10 Most Producing Countries: Research Articles on AI and Stock Market

The Figure 2 illustrates the contributions of leading countries in research on artificial intelligence (AI) and the stock market, presenting both the cumulative number of documents and the proportion of recent publications from 2022 to 2023. The United States holds the leading position with the highest number of total documents, reflecting its longstanding leadership in AI research. However, its 19% growth in publications over the last 2 years suggests a more gradual increase compared to other nations. The slower growth may be due to the maturity of AI research in the United States, where foundational work has already been extensively established. Nevertheless, the United States remains a global hub for technological innovation, particularly in AI applications for financial forecasting, algorithmic trading, and real-time decision-making tools.

China stands out as a significant contributor with an impressive 38% growth in recent years. This rapid increase underscores China's growing commitment to AI research, particularly in financial technology and algorithmic trading systems. The surge aligns with China's broader national priorities, including its strategic investments in AI and its aim to position itself as a global leader in both technology and finance. Chinese researchers are increasingly addressing challenges such as market volatility, risk management, and predictive analytics, driven by the nation's expanding financial markets and government-backed research initiatives.

India emerges as one of the most notable players, exhibiting the highest growth rate of 47%. This sharp increase signals India's rapid rise as a key contributor to AI-finance research. The growth can be attributed to several factors, including increased collaboration between academia and the fintech industry, advancements in machine learning techniques, and India's focus on addressing real-world financial challenges. As a developing economy, India's contributions often explore the applicability of AI tools in enhancing financial inclusion, optimising stock market efficiency, and supporting emerging financial technologies.

The United Kingdom maintains a strong research presence, with 21% of its publications emerging between 2022 and 2023. This steady growth reflects the UK's emphasis on both practical and theoretical applications of AI in financial markets.

Research from the UK often explores topics such as algorithmic trading, regulatory frameworks, and ethical considerations surrounding AI adoption. The country's well-developed financial sector, coupled with a strong academic infrastructure, ensures its relevance in this global research landscape. In Taiwan, research contributions have grown notably, with 26% of documents published in the last 2 years. Taiwan's focus on AI and financial technology reflects its position as a technological hub in Asia. Recent studies have explored the integration of AI in stock market prediction, risk assessment, and real-time financial analytics. The country's advancements are bolstered by its expertise in semiconductor technology and data-driven innovation.

Canada and Australia show more modest growth rates of 25% and 16%, respectively. Canada's research focuses on practical AI applications such as portfolio management, market risk mitigation, and trading optimisation. Canadian researchers often collaborate with fintech companies, driving innovation in applied machine learning and predictive analytics. Meanwhile, Australia's growth, while slower, reflects its focus on niche areas such as high-frequency trading, financial engineering, and sustainable financial technologies. South Korea presents a strong performance with a 33% growth rate, highlighting its rising interest in applying AI to financial market challenges. South Korean research often centres on high-frequency trading systems, liquidity analysis, and the role of machine learning in improving stock market efficiency.

## 4.3. Top 10 Subject Areas: Research Articles on AI and Stock Market

The Figure 3 provides a detailed breakdown of the top 10 subject areas contributing to research on AI and the stock market, highlighting both the cumulative total of documents and the percentage of publications from 2022 to 2023. At the forefront of this research domain is Business & Economics, which accounts for the largest share of documents published overall. Notably, 27%
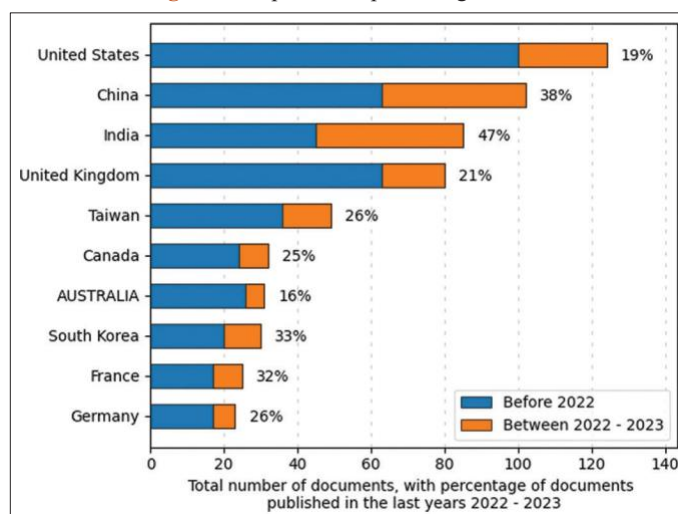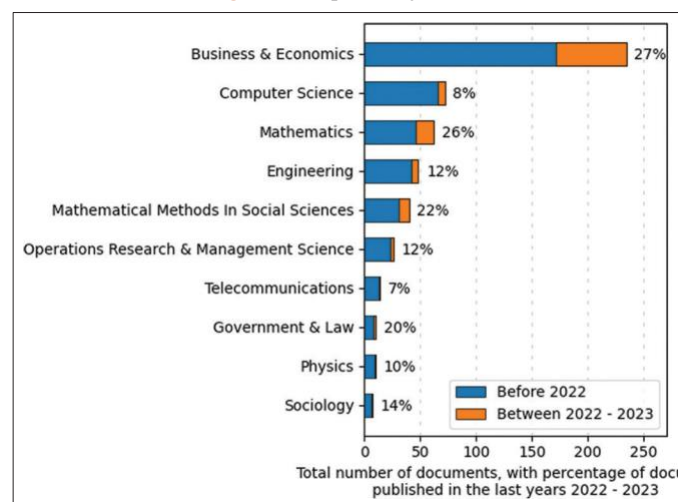
**Figure 2:** Top 10 most producing countries



**Figure 3:** Top 10 subject areas

of its publications emerged between 2022 and 2023, signaling the continued dominance of this field in AI-stock market research. The focus on Business & Economics is unsurprising, as the financial sector remains one of the earliest adopters of AI technologies. Scholars in this domain have explored themes such as algorithmic trading, stock price forecasting, market risk management, and the application of machine learning techniques to improve market efficiency.

The next significant contributor is Computer Science, albeit with a relatively modest 8% growth in recent years. Computer Science serves as the backbone of AI research, providing the algorithms, frameworks, and computational power necessary to drive advancements in financial applications. While its growth appears smaller compared to other fields, this reflects the discipline's maturity, as many foundational AI technologies were pioneered within this area. Recent publications from 2022–2023 have primarily focused on the development of deep learning models, high-frequency trading algorithms, and real-time data analytics that facilitate efficient stock market predictions. Mathematics emerges as a critical field, showing a remarkable 26% growth in publications in the last 2 years. This trend highlights the increasing reliance on mathematical theories and models to optimize AI applications in stock market analysis. The strong growth reflects the collaborative role Mathematics plays in enhancing the predictive power and accuracy of AI systems used in trading and financial risk assessment (Cohen, 2022).

Another noteworthy field is Engineering, which recorded a 12% growth during 2022–2023. Engineering's contributions to AI-stock market research stem from its role in building technological infrastructure and facilitating data processing capabilities that underpin modern financial systems. Engineering research often integrates AI with hardware systems and real-time processing solutions, which are essential for high-frequency trading and large-scale financial analytics. Mathematical Methods in Social Sciences also demonstrates significant progress, with a 22% increase in publications over the past 2 years. The fields of Operations Research and Management Science and Telecommunications contribute modestly, with growth rates of 12% and 7%, respectively. Operations Research focuses on the optimization of processes, such as resource allocation, financial modeling, and trade execution, which are critical components of algorithmic trading. Meanwhile, Telecommunications plays a supporting role by addressing challenges in data transmission and communication infrastructure, particularly in high-frequency trading environments that demand low-latency systems.

## 4.4. Top 10 Highly Cited: Research Articles Related to AI and Stock Market

Table 2 indicate the top 10 highly cited research articles on AI and the stock market represent a blend of foundational contributions and cutting-edge methodologies that have shaped this interdisciplinary field. The study by Hendershott et al. (2011), published in the Journal of Finance, is the most cited article in this category, with 810 citations. It investigates whether algorithmic trading enhances market liquidity, offering empirical evidence of its role in improving market efficiency. Similarly, O'Hara's (2015) contribution in the Journal of Financial Economics explores high-frequency market microstructure, focusing on the rapid evolution of trading practices and their implications. These works underscore the significant role of AI-driven algorithms in reshaping trading environments, providing both theoretical insights and practical implications for regulatory frameworks.

Schumaker and Chen (2009) introduced a novel approach to stock market prediction through textual analysis of breaking financial news using the AZF in Text System. Published in ACM Transactions on Information Systems and cited 474 times, this study exemplifies the integration of AI with natural language processing (NLP) for predictive analytics. Complementing this, LeBaron et al. (1999) delve into the time series properties of an artificial stock market, a pioneering effort cited 446 times in the Journal of Economic Dynamics & Control. Their work laid the groundwork for understanding the complex dynamics of artificial markets, which are crucial for developing robust AI systems. The integration of machine learning techniques is another dominant theme. Patel et al. (2015) demonstrated a fusion of machine learning techniques to predict stock market indices, achieving notable accuracy. Published in Expert Systems with Applications

**Table 2: Top cited papers**

| Author's | Title | Source Title | Cited |
|---|---|---|---|
| Hendershott et al. (2011) | "Does Algorithmic Trading Improve Liquidity?" | Journal of Finance | 810 |
| Schumaker and Chen (2009) | "Textual Analysis of Stock Market Prediction Using Breaking Financial News: The AZF in Text System" | ACM Transactions on Information Systems | 474 |
| LeBaron et al. (1999) | "Time series properties of an artificial stock market" | Journal of Economic Dynamics & Control | 446 |
| Patel et al. (2015) | "Predicting stock market index using fusion of machine learning techniques" | Expert Systems with Applications | 401 |
| O'Hara (2015) | "High frequency market microstructure" | Journal of Financial Economics | 301 |
| Chaboud et al. (2014) | "Rise of the Machines: Algorithmic Trading in the Foreign Exchange Market" | Journal of Finance | 262 |
| Kuo et al. (2001) | "An intelligent stock trading decision support system through integration of genetic algorithm based fuzzy neural network and artificial neural network" | Fuzzy Sets and Systems | 249 |
| Nti et al. (2020) | "A systematic review of fundamental and technical analysis of stock market predictions" | Artificial Intelligence Review | 243 |
| Singh and Srivastava (2017) | "Stock prediction using deep learning" | Multimedia Tools and Applications | 237 |
| Chatzis et al. (2018) | "Forecasting stock market crisis events using deep and statistical machine learning techniques" | Expert Systems with Applications | 213 |

and cited 401 times, this study exemplifies the potential of combining diverse AI methods for improved performance. Similarly, Singh and Srivastava's (2017) work on stock prediction using deep learning highlights the transformative potential of deep neural networks. With 237 citations in Multimedia Tools and Applications, this research underscores the increasing reliance on sophisticated AI architectures in financial forecasting. Kuo et al. (2001) proposed an intelligent stock trading decision support system that integrates genetic algorithms, fuzzy neural networks, and artificial neural networks. Their article, published in Fuzzy Sets and Systems and cited 249 times, represents an early attempt to create hybrid AI systems tailored to complex decision-making processes in trading. This interdisciplinary approach exemplifies the versatility of AI in addressing diverse challenges in stock market analysis.

Nti et al. (2020) offered a systematic review of fundamental and technical analysis in stock market predictions, amassing 243 citations in Artificial Intelligence Review. Their work synthesises existing knowledge, providing a comprehensive framework for future research. Meanwhile, Chatzis et al. (2018) focused on forecasting stock market crises using both deep learning and statistical machine learning techniques. Published in Expert Systems with Applications and cited 213 times, their study highlights the critical role of AI in crisis prediction and risk management. Chaboud et al. (2014) examined algorithmic trading in the foreign exchange market, providing insights into the global reach of AI applications. Their work, cited 262 times in the Journal of Finance, broadens the scope of AI in financial markets beyond stock trading. This study aligns with the growing

interest in leveraging AI for diverse financial instruments and markets. Collectively, these highly cited articles demonstrate the multifaceted applications of AI in stock market analysis. From algorithmic trading to hybrid AI systems and deep learning methodologies, these studies illustrate the transformative impact of AI on financial markets.

## 4.5. All Keyword Co-occurrence: Research on Artificial Intelligence and Stock Market

The keyword co-occurrence network in Figure 4 generated using the full counting method provides an insightful visualisation of the key thematic areas in artificial intelligence (AI) research within financial markets. Among 3,018 keywords, 42 met the minimum threshold of 15 occurrences, revealing the most frequently discussed topics and their interconnections. The green cluster is the largest and most prominent, centred around the keyword's artificial intelligence, machine learning, and stock market. This cluster encapsulates the core applications of AI in financial markets, particularly stock market prediction, decision-making, and investments. According to Kurani et al. (2023), terms like data mining, support vector machines, and neural networks highlight the dominance of computational models and algorithms in analysing financial data. The strong connections with terms such as decision support systems and finance suggest the emphasis on leveraging AI to enhance the decision-making process in investment strategies.

The red cluster is centred on financial markets, forecasting, and electronic trading, reflecting the application of AI to enhance market performance and trading efficiency. Terms like time

**Figure 4:** All keyword co-occurrence
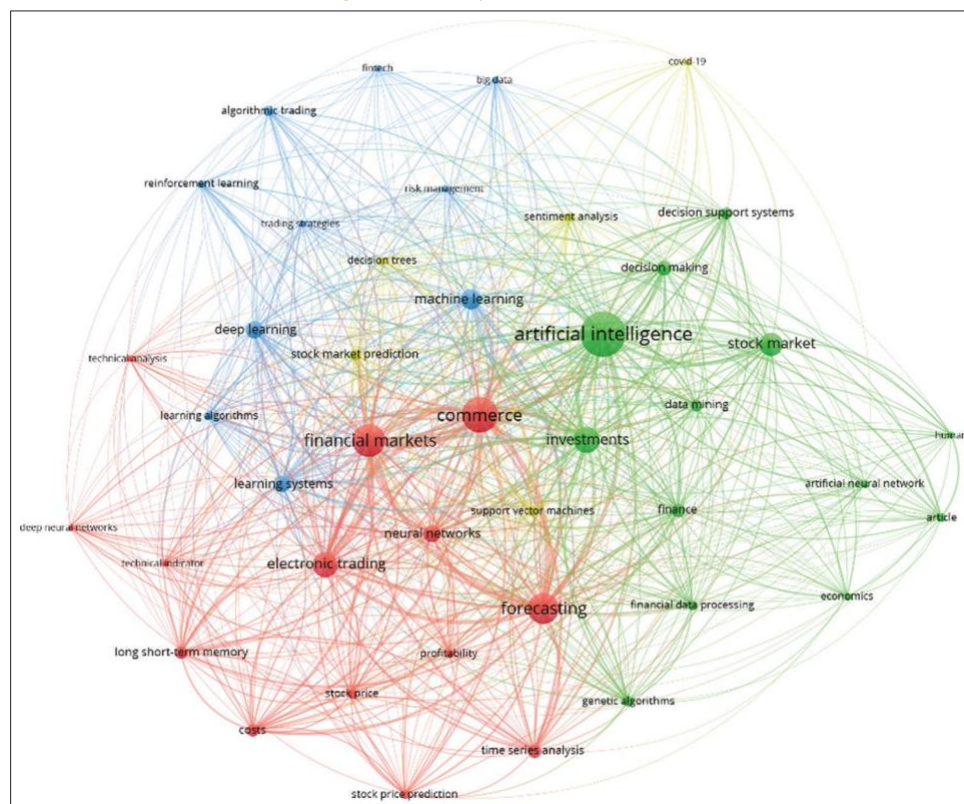
series analysis, stock price prediction, and genetic algorithms demonstrate the importance of predictive modelling and optimisation techniques in trading and forecasting. According to Li et al. (2023), this cluster also includes specific methods such as long short-term memory (LSTM) and deep neural networks, which are widely used for predicting stock price movements and analysing complex time series data. The blue cluster is dominated by terms like deep learning, algorithmic trading, and risk management, which reflect the integration of advanced AI techniques with risk assessment and automated trading systems. Keywords such as reinforcement learning, decision trees, and technical analysis suggest an emphasis on AI systems that adapt to dynamic market conditions. This cluster highlights the growing sophistication of AI models, particularly in developing systems capable of learning from and responding to market changes in real time (Rane et al., 2024). The connections to big data suggest that researchers are leveraging vast datasets to train these systems and refine their predictive capabilities (Singh et al., 2022).

A smaller but significant yellow cluster contains terms like COVID-19, sentiment analysis, and big data, reflecting the impact of external shocks and novel techniques on financial markets. This cluster signifies the increasing relevance of contextual and behavioural factors in financial modelling, with AI being used to analyse non-traditional data sources such as social media sentiment and global events. The inclusion of COVID-19 underscores the importance of adaptive AI systems that can respond to unprecedented disruptions in financial markets (Bishnoi et al., 2023), highlighting the role of AI in managing volatility and uncertainty (Asgharian et al., 2023; Bishnoi et al., 2023). The keyword co-occurrence network provides valuable insights into

the current state of research, but it also hints at future directions such as the inclusion of terms like sentiment analysis suggests a growing focus on integrating behavioural insights into financial models.

Future research will likely explore how AI can process and analyse human sentiment from social media, news, and other unstructured data sources to make more accurate predictions. According to Gill et al. (2022), the prominence of terms such as reinforcement learning and deep learning indicates a trend toward developing AI systems that adapt to market dynamics in real time. This could lead to more robust models capable of operating autonomously in highly volatile environments. As global priorities shift towards sustainability, future research is likely to explore the application of AI in evaluating environmental, social, and governance (ESG) factors in investment decisions (Lim, 2024). This may involve integrating diverse data sources to assess the long-term viability of investments. The impact of keywords like COVID-19 highlights the need for AI systems that can anticipate and respond to external disruptions. Future work will likely focus on creating resilient models that incorporate macroeconomic, geopolitical, and public health factors.

## 4.6. The Evolution of AI and Stock Market Research: A Time-Based Perspective

The term co-occurrence network (Figure 5) related to the AI and stock market research, visualised through the binary counting method, reveals critical thematic areas by identifying relationships between 144 frequently occurring terms from a pool of 11,566. The overlay visualisation of keyword co-occurrence offers a compelling insight into the progression of artificial intelligence (AI) research in

**Figure 5:** Term co-occurrence network
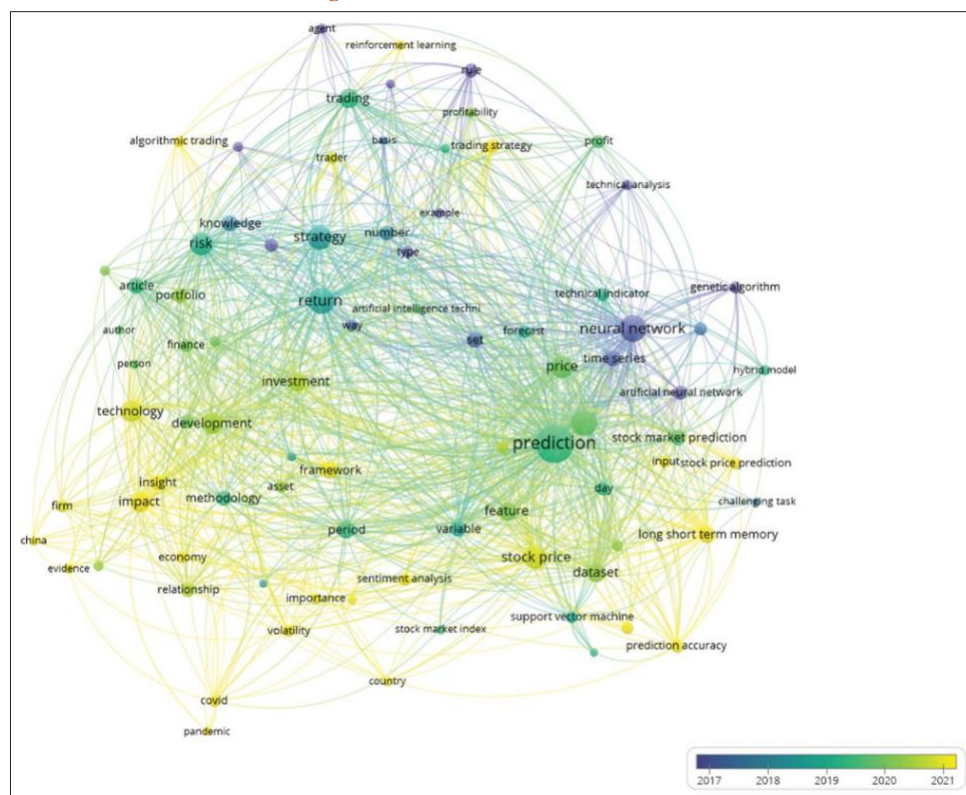
the stock market domain between 2017 and 2021. The early phase, represented by blue nodes, captures the foundational groundwork of AI applications in stock market research. Terms such as "neural networks," "time series," and "technical indicators" dominate this cluster, highlighting the reliance on established machine learning methods to model financial trends. This period was marked by a focus on prediction and analysis, with tools like genetic algorithms and technical indicators serving as the cornerstone of research efforts. According to Stiefenhofer et al. (2024), the integration of AI into traditional financial approaches, such as portfolio optimisation and risk management, reflects the field's ambition to refine and automate well-established methodologies. Early explorations of adaptive AI systems, signified by "reinforcement learning," underscore the initial steps toward creating tools capable of learning from market dynamics.

As the field matured, the green cluster signifies a shift toward refining predictive models and enhancing data integration between 2019 and 2020. Keywords such as "prediction," "support vector machine," and "long short-term memory (LSTM)" reflect the growing sophistication of algorithms used to handle the complexities of stock market forecasting. This period also saw the rise of sentiment analysis, representing a significant departure from purely quantitative data to include behavioural and qualitative insights. This shift highlights an increasing recognition of unstructured data sources, such as social media and news sentiment, as valuable inputs for predicting market behaviour and trends.

The most recent phase, marked by yellow nodes, illustrates the field's response to global disruptions and new challenges. Terms such as "pandemic" and "COVID" point to the influence of the global health crisis on financial markets and the subsequent shift in research priorities. This cluster represents an era of resilience, where researchers sought to model and mitigate the impacts of unprecedented global events. Terms like "volatility" and "economy" further underscore this focus on building AI systems that can withstand external shocks and provide reliable insights even during periods of uncertainty. Simultaneously, the emergence of terms like "development" and "framework" suggests a broader effort to establish comprehensive methodologies for integrating AI into financial systems.

The evolution from foundational methods to behavioural insights and resilience-building reflects the dynamic and adaptive nature of AI research in finance (Sahid et al., 2023). Researchers have moved beyond static models to embrace tools that account for human behaviour, external disruptions, and systemic risks. According to Nti et al. (2020), the growing emphasis on adaptability, robustness, and broader impacts ensures that AI will continue to play a transformative role in stock market analysis. This progression underscores the field's capacity to respond to both technological advancements and real-world challenges. By blending sophisticated algorithms with a deeper understanding of market behaviour and global events, AI research in the stock market is poised to shape the future of finance (Singh et al., 2022). As markets evolve, the ability of AI to adapt and integrate into these complex systems will remain central to its success. This

visualisation, therefore, captures not only the past and present of AI in finance but also its promising trajectory toward a more resilient and intelligent financial future.

## 5. CONCLUSION

The integration of Artificial Intelligence (AI) in stock market research has fundamentally transformed the field, offering innovative tools that enable advanced predictive modeling, algorithmic trading, and improved financial decision-making. This bibliometric analysis has revealed how AI methodologies, including machine learning, deep learning, and natural language processing, have evolved from foundational research to advanced applications, tackling the increasing complexities of financial markets.

Looking ahead, the future of AI in stock market research is set to align closely with emerging global priorities and technological advancements. One promising trend is the rise of hybrid models that blend traditional quantitative methods with modern AI algorithms, combining the strengths of both approaches to achieve higher prediction accuracy and model robustness. As markets become increasingly volatile and complex, the ability of AI to integrate diverse data types with the ranging from historical trends to real-time sentiment analysis will be pivotal. Behavioural insights, particularly those derived from sentiment analysis and social media data, are expected to become integral components of AI frameworks, helping researchers and investors understand and predict market sentiment with greater precision. Moreover, real-time adaptive AI systems powered by reinforcement learning are likely to dominate applications in high-frequency trading and dynamic risk management, providing rapid and informed responses to market fluctuations.

The application of Artificial Intelligence (AI) in stock market research has been transformative, but it is not without limitations. The application of AI in stock market research is marked by its transformative potential, yet its journey is far from complete. The field has made remarkable strides in advancing predictive accuracy, market efficiency, and decision-making processes, but challenges related to data quality, model transparency, and ethical considerations persist. Future research must address these limitations while exploring new frontiers such as sustainability, behavioural finance, and resilience to global disruptions. By embracing interdisciplinary collaboration and fostering innovation, AI will continue to shape the future of stock market research, ensuring that it remains adaptive and impactful in the face of an ever-changing global economy.

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