

From cognitive bias to technological intervention: A systematic and bibliometric review of technology's role in investor behavioral biases

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Abstract

This study examines the evolving landscape of behavioral biases in financial decision making as technology becomes increasingly embedded in investment processes. Using a PRISMA based systematic review combined with bibliometric analysis, 166 Scopus indexed publications spanning 1991 to 2025 were analysed using Biblioshiny and VOSviewer. The review maps emerging research clusters where technology plays a central role, including fintech platforms, digital trading systems and robo advisory services that mediate biases in real time, artificial intelligence based prediction of behavioral patterns, sentiment analysis and social media analytics used to capture investor psychology, and cryptocurrency and blockchain based markets where algorithmic trading and information asymmetry intensify behavioral distortions. Temporal analysis reveals a marked acceleration in technology centric behavioral finance research after 2017, particularly around AI enabled sentiment modeling and crypto market analytics. Content analysis identifies several gaps and future research directions, including comparisons of human versus algorithmic trading decisions, investor interactions with robo advisors and AI systems, the extent to which technology shapes or amplifies biases, and the development of real time, data driven models for detecting and measuring behavioral biases using big data, machine learning and behavioral tracking. The study offers a structured foundation for understanding behavioral biases in technology driven financial markets and provides guidance for future improvements in forecasting, risk management and policy design.

Keywords: Behavioral Biases, Investor Behavior, Fintech, Bibliometric Analysis, Systematic Review, Sentiment Analysis, Robo Advisors, Cryptocurrency Markets

JEL Classification: G40, G41, O33

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1. Introduction

Behavioral biases and technological advancements are increasingly shaping financial market forecasting. Investors' decisions are often influenced by cognitive and emotional biases such as overconfidence, herding, and loss aversion, which can lead to systematic deviations from rational market behavior. At the same time, rapid developments in technology such as expansion of mobile trading applications where investors come across with real time access, commission free trading, interaction with robo-advisors (Nourallah et al. 2026), raised a concern about their potential influence on investor behavior and their decision-making quality. These developments highlight the limitation of traditional financial theories, which presume that markets are efficient and that investors behave rationally, give rise to behavioral finance. Building on the prospect theory of Tversky and Kahneman (1979), which contends that people perceive gains and losses differently and behave as risk-seekers toward losses and risk-averse toward gains. Further Festinger's Theory of Cognitive Bias, emphasizes that behavior is influenced by cognitive processes, including emotions and perceptions. Ricciardi (2000) asserts that behavioral finance integrates theories and concepts from several academic fields, including finance, psychology, and sociology, to comprehend how the "normal" investor makes decisions. Statman (2014) further contrasted traditional and behavioral finance. De Bondt (2010) claims that behavioral finance is pragmatic. Avgouleas (2015) demonstrated similar pragmatism when challenging the Efficient Market Hypothesis (EMH), stating that both of its primary assumptions have been challenged by behavioral finance. Antony (2019) noted, Expected Utility Theory served as the foundation for social studies for a long time that sought to understand the factors that influence human behavior. Shefrin and Statman (1984) made the case that personal preferences are greatly influenced by feelings and cognitive mistakes. Furthermore, Statman (2014) argued that while novice investors have not yet realized the full impact of emotional and cognitive errors, they frequently place their faith in false information. Within this context, different biases came into existence such as heuristic bias which plays an important role in investors' risk tolerance level as per Salman et al. (2020). According to Shefrin and Statman (2000), overconfidence has two main effects on investors: it can lead to excessive trading and a failure to generalize knowledge. Furthermore, investors' decision-making process heavily relies on mental accounting (Zhang & Sussman, 2018). Given these considerations, the present study explores the current state of knowledge in the field of investment biases through a bibliometric analysis. The findings aim to support scholars and researchers—particularly those new to the domain—in developing a foundational understanding of investment biases and identifying future research directions.

2. Literature Review

Recent literature (2025–2024) highlights the growing integration of behavioral biases within financial decision-making and technology-driven environments. Wei and Ahmad (2025) examine the herd behavior in Chinese stock market, demonstrating how economic policy uncertainty

significantly influences market behavior and investor responses. Similarly, Satish and Sunil(2025) investigate heuristic biases among millennial investors, revealing that financial literacy plays a moderating role, whereas financial technology does not significantly alter bias-driven decisions. Extending this line of inquiry, Akin and Akin (2024) establish that recency bias contributes to market volatility and explains the negative relationship between the S&P index and the volatility index. In the context of emerging assets, Kauret al. (2024) identify fear of missing out (FOMO) as a significant mediating factor influencing cryptocurrency investment decisions across both salaried and self-employed investors. Likewise, Dhingra and Yadav (2024) provide evidence of persistent overconfidence bias in the Indian equity ETF market before and during the COVID-19 period, using VAR and impulse response analysis to show that past returns drive current trading volumes. Further, Kathpal et al. (2024) demonstrate that risk perception significantly influences heuristic biases such as anchoring, representativeness, and availability, with demographic variables like age and gender acting as moderators. A comprehensive review by Shah and Butt (2024) identifies a critical research gap in the under-explored gambler's fallacy, despite extensive attention to overconfidence and representativeness biases. In digital contexts, García and Alonso (2024) show that price-perception bias in cryptocurrency markets—captured through Twitter sentiment—triggers stronger emotional reactions toward low-priced assets, thereby contributing to volatility.

In the Indian context, Raj (2024) finds that mental accounting, overconfidence, and herd behavior significantly influence retail investment decisions, with gender differences indicating higher susceptibility to herding among female investors. Earlier work by Bhuvaneswari et al. (2023) supports these findings, demonstrating through SEM and MANCOVA that investors often deviate from rational decision-making due to availability and loss aversion biases. Similarly, Roy (2023) shows that recurrence bias and volatility perception bias among foreign exchange dealers contribute to heightened market volatility following news events. Experimental evidence from Li and Rong (2023) further reveals memory recall bias, where investors tend to forget poorly performing stocks more readily than successful ones. From a bibliometric perspective, Gutiérrez-Nieto et al. (2022) trace the evolution of the disposition effect, highlighting its increasing scholarly influence since 1985. Complementing this, Zhang et al. (2022) identify optimism bias as a key driver of real estate investment decisions, with risk perception acting as a mediator and information asymmetry strengthening its effects. Earlier experimental work by Riff and Yagil (2021) demonstrates that while home bias influences investor preferences, strong corporate branding can override geographic familiarity.

Additional studies further enrich the understanding of behavioral finance. Din et al. (2021) show that Shariah literacy mitigates biases such as self-attribution and illusion of control in Islamic financial products. El and Toumia (2020) confirm the presence of status quo bias among venture capital firms using dynamic panel models. Similarly, Chen (2018) highlights round-number bias, where investors cluster trades around psychologically significant price levels. Earlier foundational contributions include Costa et al. (2017), who conduct a large-scale bibliometric analysis

identifying confirmation bias as relatively underexplored compared to overconfidence and anchoring. Rapp (2016) finds that while extrapolation bias exists among private investors, it does not significantly affect market prices due to the corrective actions of professional traders. Experimental research by Blaufus and Möhlmann (2014) shows that tax aversion bias diminishes with experience and feedback, while Teoh and Zhang (2011) caution against methodological biases arising from improper data trimming. Beyond these, studies such as Tavor (2013) reveal that hindsight bias varies across age and income groups, while Kalra et al. (2020) identify zero bias in retirement fund selection. Moderating factors such as financial literacy (Ashfaq et al., 2024) and contextual influences—including market conditions, uncertainty, and culture (Hoffmann and Anwar, 2024)—are increasingly recognized as critical in shaping investor behavior. Importantly, recent research also highlights the intersection of behavioral biases and technology. González (2020) explores blockchain adoption, while P.T. and Lysande (2021) analyze crowdfunding platforms, demonstrating how biases moderate technology adoption. More recently, Garekwe et al. (2024) show that behavioral biases significantly influence the adoption of AI-driven banking services.

Methodologically, the literature reflects substantial diversity, employing techniques such as structural equation modeling (SEM), partial least squares multi-group analysis (PLS-MGA), fuzzy analytic hierarchy process (FAHP), bibliometric tools, and experimental designs—including lab-in-the-field approaches (e.g., Labajova et al., 2022). Collectively, these studies demonstrate that behavioral biases not only shape individual investment decisions but also contribute to broader market anomalies and deviations from the efficient market hypothesis. In accordance with the recent advancement in this field, this study aims to accomplish the objectives as follows:

1. Detailed insights into behavioral finance with reference to behavioral biases and their relation to technology
2. To identify and map influential authors, journals, and institutions that connect technology with the study of investor behavioral biases
3. To uncover emerging research clusters and knowledge gaps where technology can be used to mitigate investment biases

3. Results

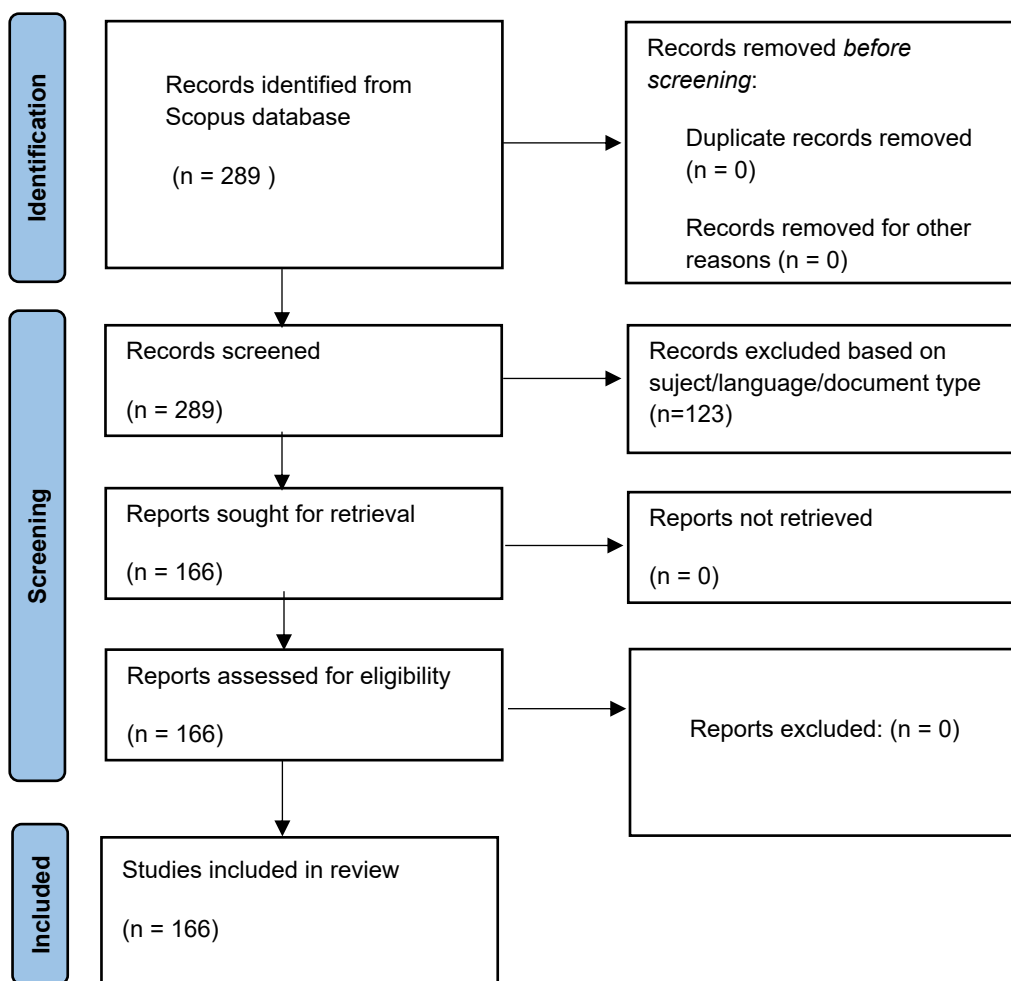
3.1 Search Criteria and Selection of Final Articles

To finalize paper selection, two steps procedure was followed Khaw et al. (2024) integrating bibliometric analysis with a structured review. This approach enables both a quantitative mapping of the behavioral bias literature with the integration of technology and a qualitative examination of its key thematic developments and evolving investment strategies.

3.1.1 Study Selection and Process and Methods

The article followed the Prisma (flow diagram) guidelines, a standard approach in conducting systematic literature review in all the research fields (aslam and jawaid 2023, David et al., 2023). Table 1 illustrates the methodological process. The targeted database used was Scopus is on 29th March 2026, broad search queries were employed using Boolean search criteria, combining keywords with operators such as AND and OR ("behavioral bias" OR "investor behavior" OR "investment bias" AND "technology" OR "discussion forum" OR "sentiment analysis" OR "robo advisor" OR "app-based trading"). This process resulted in 289 records from Scopus, time span (1991–2025). Furthermore, limited the document types to journal articles, conference papers, conference review, included only English-language publications, further fields which were included Economics Econometrics and Finance, Business Management and Accounting, Social Sciences, Psychology, Multidisciplinary, decision sciences. Overall, 123 records were excluded based on criteria related to database source, document type, time frame, language, and subject relevance. The final dataset of 166 articles forms the basis for subsequent bibliometric analysis.

Figure 1. PRISMA Flowchart



3.1.2 Bibliographic Data Analysis

The dataset was imported to R studio and VOSviewer for bibliometric analysis. The bibliometric analysis comprised: (1) performance analysis—annual scientific production, authorship, citation metrics; (2) science mapping—keyword co-occurrence, thematic mapping, collaboration networks; and (3) trend analysis—evolution of research topics over time. The visualization outputs included annual scientific production, most globally cited articles and journals, most productive countries, co-occurrence networks, keywords, and thematic analysis, which are presented in the subsequent section.

3.2 Annual Production

The research publication patterns are shown in Figure 2. Despite 2024 being the most productive year, the field's study history began in 1991. The early research trends received less attention. But since 2016, research on behavioral biases in finance has accelerated.

Figure 2. Annual Production Chart

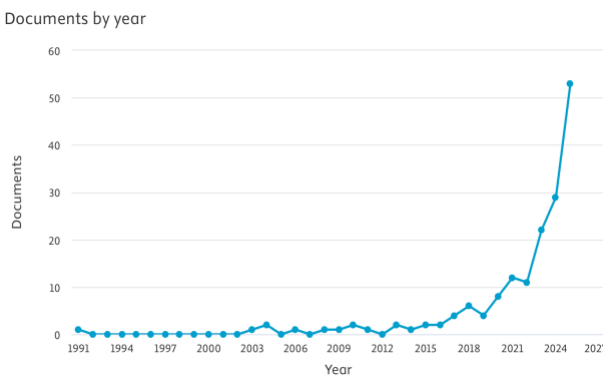
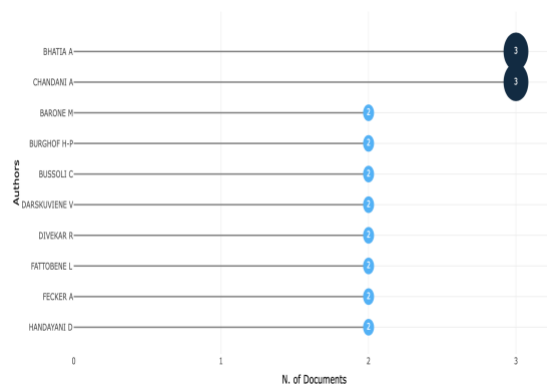


Figure 3. Author's Production



3.3 Most Relevant Authors and their Production

Figure 3 virtually represents the most productive authors by the quantity of papers they have published. The chart reveals that Bhatia and Chandani are the leading contributor with 3 documents, indicating his dominant research actively within the dataset. Others have contributed 2 documents each, reflecting a moderate but noteworthy level of scholarly involvement. This distribution suggests a small core group driving a significant portion of research output.

3.4 Source's Production, Source's Impact

Table 1 which represents the sources of scholarly articles, detailing about the number of articles published by each source. It is evident that the Journal of Behavioral Finance is a prolific outlet for behavioral finance research, followed by other journals. Overall, the table indicates a moderately diversified publication landscape, with both finance related journals and multidisciplinary journals.

Table 1. Most Relevant Sources

Sources	Articles
JOURNAL OF BEHAVIORAL FINANCE	4
2023 8TH INTERNATIONAL CONFERENCE ON BUSINESS AND INDUSTRIAL RESEARCH, ICBIR 2023 - PROCEEDINGS	3
SUSTAINABILITY (SWITZERLAND)	3
BEHAVIOUR AND INFORMATION TECHNOLOGY	2
COMPUTERS IN HUMAN BEHAVIOR REPORTS	2
CREDIT AND CAPITAL MARKETS	2
ENVIRONMENTAL AND RESOURCE ECONOMICS	2
FINANCE RESEARCH LETTERS	2
INDIAN JOURNAL OF FINANCE	2
INTERNATIONAL JOURNAL OF ACCOUNTING AND ECONOMICS STUDIES	2

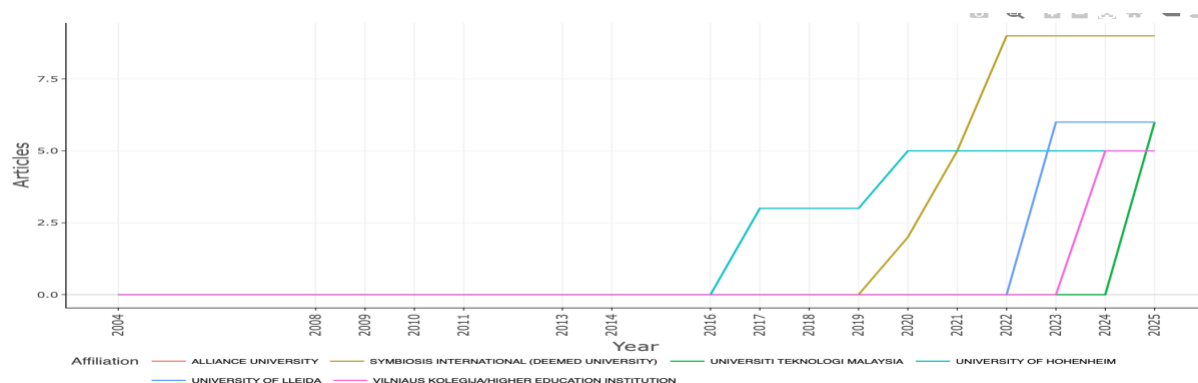
3.5 Affiliation Production

Table 2 highlights the research productivity of various academic institutions based on the number of articles published. Symboisis international leads with the highest output, contributing 9 articles, indicating its prominent role in research related to topic understudy. This is followed by Alliance University, University Teknologi Malaysia, University of Lleida each contributing 6 articles, reflecting a strong and consistent presence in the field. Additionally, figure 4 depicts the temporal trend of research output from key academic affiliations over time. Most affiliations display peaks between 2020 and 2024. Overall, the graph highlights both early and recent contributions in the field, showing that while some universities have maintained consistent engagement, others have emerged more recently with growing influence in scholarly output.

Table 2. Affiliation Production

Affiliation	Articles
SYMBIOSIS INTERNATIONAL (DEEMED UNIVERSITY)	9
ALLIANCE UNIVERSITY	6
UNIVERSITI TEKNOLOGI MALAYSIA	6
UNIVERSITY OF LLEIDA	6
UNIVERSITY OF HOHENHEIM	5
VILNIAUS KOLEGIJA/HIGHER EDUCATION INSTITUTION	5
BEIHANG UNIVERSITY	4
ERASMUS UNIVERSITY	4
ISM UNIVERSITY OF MANAGEMENT AND ECONOMICS	4
HANYANG UNIVERSITY	3

Figure 4. Affiliation Production Chart



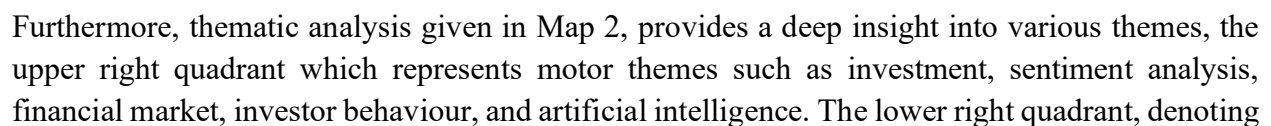
3.6 Country's production over time

Figure 5 provide a time series line chart of geographic overview of research contribution by various countries in the domain. Countries which are prominent in this domain are China, India, Indonesia, Korea and USA being measured on a time span of 2003 to 2024. Overall, the production remains the same over the years but has increased post 2020. Among all, India exhibits a steep rise in the publication, emerging as the leading contributor in 2024. The same upward trend can also be seen

Figure 5. Line Chart of Country's Production over Time

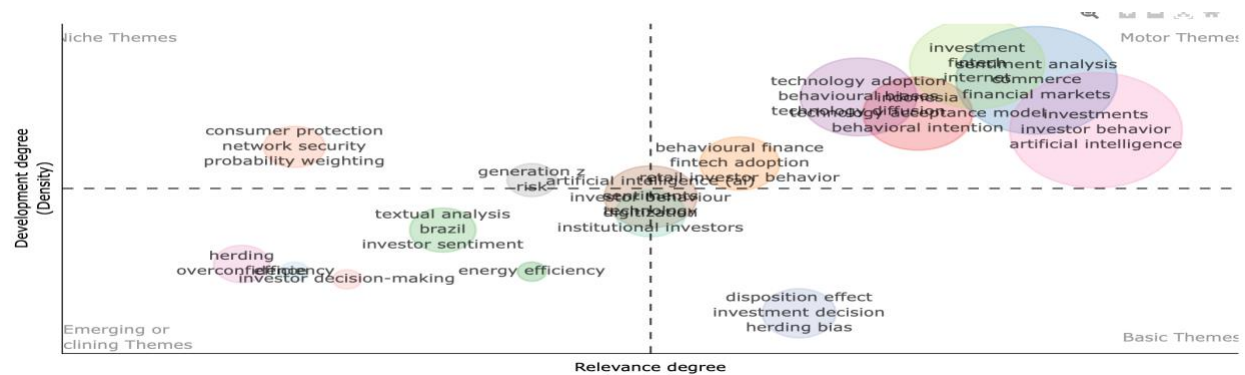


Map 1. Keyword Co-Occurrence Analysis



basic themes includes fundamental constructs, such as disposition effect, hearing bias and investment decisions, which are essential to this field.

Map 2. Thematic Analysis



4. Discussion

The findings of this bibliometric study reveal several significant trends in behavioral finance research, offering insights into both its historical development and future direction. The analysis confirms that biases such as overconfidence, loss aversion, anchoring, representativeness, and herding—remain foundational to understanding investor behavior. These results are consistent with earlier studies (Barberis & Thaler, 2003; Kahneman & Tversky, 1979), which have long established that investor decision-making often departs from the rational agent model proposed by traditional finance theories such as the Efficient Market Hypothesis (EMH).

Recent studies increasingly examine the interaction between these behavioral biases and emerging financial technologies. The bibliometric analysis, particularly the thematic map and keyword co-occurrence visualizations, highlights the growing prominence of terms like "sentiment analysis", "fintech", "cryptocurrency" and "robo advisors". This can further be confirmed with the Tree Map given as Map 3, in which each rectangle contains one keyword and its size reflects its frequency of the occurrences.

With the information provided above reflects a noticeable trend shift which leads scholarly attention towards the digital transformation of financial services and how these innovations are interacting with investor psychology. For instance, González (2020) explores blockchain's systemic implications; P.T. and Lysander (2021) investigate how crowdfunding adoption interacts with behavioral factors; Garekwe et al. (2024) demonstrate that customer readiness for AI-driven banking is shaped by cognitive biases; and Kaur et al. (2024) introduce the concept of FOMO (fear of missing out) as a critical influence on crypto investment behavior. Similarly, García and Alonso (2024) find that emotional responses to cryptocurrency prices on social media are affected by price perception biases.

Map 3. Tree Map



This study set out to explore the evolving landscape of behavioral finance by conducting a bibliometric analysis of literature indexed in the Scopus database published between 1991 to 2025. The study employed VOSviewer and Biblioshiny version 4.5.1 to generate graphical presentation of influential authors, affiliations, prominent sources for publishing the article and for various graphical visualisation. The primary objective was to identify the influence of behavioral biases on investment decision-making and examine how technological advancements are shaping investor behavior. The findings revealed that there is growth in academic research which can clearly be seen in figure 1 which highlights the increasing research trend in this domain. The visualizations from keyword co-occurrence map and tree map analysis confirm the emergence of technology-related themes, particularly robo advisors, sentiment analysis and AI as the dominant research themes. Furthermore, the thematic maps draw attention towards the integration of technology adoption and technology acceptance models which further delve into the growing importance of technological frameworks in understanding modern investment behavior. Moreover, the visualizations highlight the new way of evaluating data through tech driven models such as deep learning and machine learning, demonstrating the interdisciplinary coverage in this domain. Furthermore, the findings also highlight evolving global trends reflecting India, USA and China are emerging as noteworthy contributors.

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Pubmed, IEEE Xplore, and others which could possibly holds more influential literature in their data bases related to this domain. Second, the keyword selection is limited though desined carefully. Third, this data set is taken till 2025, which leaves a room for more research.

Furthermore, much of the existing research is based on cross-sectional data, limiting understanding of how biases evolve over time or react to technological and market shifts. Cross-cultural perspectives also remain underrepresented, despite growing awareness of the influence of cultural, regulatory, and economic contexts on investor behavior. Further, limited attention has been given to how multiple biases interact or how the tech enabled platforms can incorporate debiasing mechanisms. Moreover, the global trends indicate a strong potential and greater international collaboration to further advance this domain. To address these gaps, future research should employ longitudinal and experimental designs, develop investor-specific debiasing strategies, and integrate behavioral insights into traditional financial models.

In conclusion, this study demonstrates that behavioral finance has transitioned into a more interdisciplinary field, incorporating technological dimensions alongside psychological theory, such an interdisciplinary approach is vital for building more accurate, inclusive, and resilient financial systems that reflect the realities of investor behavior in a digitally driven world.

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