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Artificial Intelligence in Behavioral Finance: A Systematic Literature Review of Applications and Challenges in Indian Financial Markets

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Abstract

The current study investigates artificial intelligence (AI) applications which behavioral finance research uses to study India's developing financial markets. The study uses 85 different research studies as its foundation. The number of retail investors in India has increased significantly during recent years when more than 10 crore demat accounts became active between 2023 and 2025. The study found that people tend to develop three specific behavioral patterns which include overconfidence, herding, and loss aversion, which they use to make their investment choices. The study has two main objectives. The research investigates natural language processing (NLP) and machine learning and deep learning AI tools to detect investor biases. The research study reveals research holes, which particularly focus on how effective AI tools reduce investor biases for both urban and rural populations. The results demonstrate that NLP-based sentiment analysis outperforms traditional methods in detecting herding patterns during market instability which occurred during the 2022 Adani crisis. The CNN-LSTM model demonstrates capacity to identify overconfidence in Groww and Zerodha platform users. The robo-advisors function as effective tools which help investors reduce their biases while making better investment choices. The research reveals several essential research gaps which need to be addressed. The research identifies five main research gaps which include researchers using real-time NSE data too infrequently and researchers overlooking geopolitical risks and researchers studying rural investors too inadequately and researchers lacking explainable AI and researchers discussing SEBI regulations too briefly. The research proposes a combined framework which integrates social media sentiment analysis together with geopolitical risk assessment and rural-urban difference analysis and explainable AI technology. The SEBI organization should establish AI tool transparency requirements and A regional language support system for AI instruments in their organization. The approach enables investors to enhance their decision-making abilities while decreasing their tendency to make irrational choices.

Keywords: Artificial Intelligence, Behavioral Finance, Indian Stock Market, Herding Bias, NLP, Systematic Review, De-biasing, NSE

Introduction

The field of behavioral finance has transformed our understanding of conventional financial theories. Human psychological factors determine investment decisions according to this research which refutes the Efficient Market Hypothesis (EMH) that states markets maintain constant rationality and efficiency (Goodfellow et al., 2023). India experienced a rapid rise in retail investors who reached 10 crore demat account ownership by 2025. Digital platforms such as Zerodha and Groww provide the main support for this expansion. The market has grown but investors now exhibit behavioral patterns that include overconfidence, loss aversion, and herding which result in unstable market conditions and ineffective investment choices (Varshini & Vinayalaxmi, 2024; Madaan & Singh, 2019). The field now recognizes Artificial Intelligence (AI) as a vital resource for this research area. The system employs machine learning (ML) and natural language processing (NLP) and deep learning techniques to investigate and mitigate these biases. AI enables real-time data processing which enhances the understanding of investor behavior through comprehensive analysis (Amundi Research Center, 2025; Journal of International Education and Research, 2025).

AI establishes a primary strength because it can detect emotional and irrational elements which traditional financial models fail to include. AI-based sentiment analysis research demonstrates the ability to study social media opinions and reactions for the purpose of capturing herding behavior patterns. The approach proves beneficial for Indian National Stock Exchange markets because the COVID-19 crash of 2020 resulted in panic selling which caused greater financial losses (Das & Singh, 2024). The Paytm Money platform uses AI-powered robo-advisors to create personalized investment recommendations from user data which minimizes anchoring bias and enhances investment results (PwC India, 2022; Yadav & Kant, 2026).

AI adoption in Indian financial markets experiences rapid growth because regulatory bodies such as Securities and Exchange Board of India and Reserve Bank of India provide their backing. AI applications exist in multiple domains including fraud detection and credit scoring and investor behavior analysis (Nayak, 2024; PwC India, 2022). Financial institutions and large banks drive this transformation by implementing AI technologies to enhance their decision-making abilities through data analysis.

The field continues to face multiple unresolved obstacles. The complex design of AI systems makes them hard to grasp which leads to ethical problems. The Digital Personal Data Protection (DPDP) Act 2023 creates problems which affect data privacy through its implementation. AI systems can create more bias when training data lacks proper distribution according to Goodfellow et al. 2023 and Smith 2024. The research investigates various AI applications which include using reinforcement learning to study prospect theory biases and utilizing advanced language models to combat confirmation bias according to Varshini and Vinayalaxmi 2024 and Amundi Research Center 2025. The study investigates financial education deficiencies and currency market volatility issues which specifically affect India (Madaan & Singh, 2019). The Indian research findings demonstrate that psychological factors affect investment choices yet AI technology reduces these psychological tendencies when used with human decision making (Yadav & Kant, 2026; Das & Singh, 2024). The research establishes a connection between international AI studies and behavioral finance research which demonstrates its relevance to the Indian situation. The study proposes an operational framework of AI tools which SEBI should control through existing regulations to achieve better market performance.

Objective and Proposition of the Study

Objective:

This study aims to explore how AI tools like natural language processing (NLP) and machine learning can detect key behavioral biases—specifically overconfidence and herding—in the Indian stock market.

Proposition:

AI-driven sentiment analysis offers superior performance over traditional approaches in predicting herding behavior on the National Stock Exchange (NSE), particularly during periods of high market volatility.

Literature Review

Evolution of Behavioral Finance and AI Integration

Behavioral finance questions the idea that investors always make rational decisions. The study examines psychological biases that people typically experience, such as loss aversion which Daniel Kahneman and Amos Tversky explained in 1979 and overconfidence which causes markets to behave in unexpected ways, according to Varshini and Vinayalaxmi in their 2024 research. Artificial intelligence (AI) assists researchers worldwide in studying these biases more effectively. It uses tools like sentiment analysis and predictive models to study how investors behave (Amundi Research Center, 2025; Smith, 2024). In the beginning, simple machine learning methods were used to detect herding behavior (Goodfellow et al., 2023). Over time, more advanced techniques like deep learning have been used to study complex market patterns (Smith, 2024).

In emerging markets, AI is especially useful because it can analyze investor psychology through social media data using NLP. By studying changes in public sentiment, AI can also help in predicting market volatility (Omniwave Fintech, 2025). Some studies suggest that a large portion of trading activity is influenced by sentiment, and AI can play a role in reducing irrational investment decisions (Journal of International Education and Research, 2025).

AI Applications in Behavioral Bias Detection

AI is very helpful in measuring and understanding investor biases. For example, NLP is used to study news and online discussions (like Reddit) to identify herding behavior (Das & Singh, 2024). Reinforcement learning is also used to apply ideas from prospect theory in trading decisions (Yadav & Kant, 2026).

Robo-advisors help reduce anchoring bias by giving personalized investment advice based on data, which can improve returns to some extent (PwC India, 2022; Nayak, 2024). In fintech platforms like Groww, AI is also used to track user

behavior and identify signs of overconfidence (Madaan & Singh, 2019).

India-Specific Insights and Challenges

Indian studies show that biases like herding and loss aversion are quite common in the stock market, especially with the recent increase in retail investors. These biases strongly affect trading behavior on the National Stock Exchange (Varshini & Vinayalaxmi, 2024; Madaan & Singh, 2019).

The use of AI in the BFSI sector is also growing, and it is often seen that larger firms adopt AI more quickly. The research enables investors to gain better understanding of their behavior patterns which leads to their identification as different investor types (PwC India, 2022). The Securities and Exchange Board of India reports that investors experience stronger behavioral biases when they use mobile trading applications for their trading activities (Das & Singh, 2024).

The situation contains several major difficulties which need to be addressed. The current situation involves three main problems, including data bias problems, difficulties in understanding AI model operations, and concerns about ethical issues, which become more critical when dealing with the Digital Personal Data Protection (DPDP) Act (Nayak, 2024).

The research field demonstrates multiple gaps which need exploration. The existing studies on rural investors remain extremely limited, and research about geopolitical risk assessment remains underexplored (Yadav & Kant, 2026). Because of this, many researchers suggest that India needs better and more balanced models that combine both AI techniques and behavioral insights (ScienceDirect, 2024).

Theoretical Frameworks and Future Directions

The recent study presents a new framework which combines behavioral portfolio theory with artificial intelligence to study investor behavior (Goodfellow et al., 2023). The research shows that advanced tools which function as large language models (LLMs) can help reduce investor biases through their superior guidance capabilities (Amundi Research Center 2025). The Indian financial market needs dependable models which must undergo testing using actual data from the National Stock Exchange. The developed models enable researchers to achieve precise outcomes through SEM and PLS analysis methods (Varshini & Vinayalaxmi 2024).

Research Gap

AI systems have achieved significant progress in their application to study human financial behavior. However, researchers still need to study important research gaps which exist for Indian-based studies. The existing gaps demonstrate the necessity for

dedicated research efforts (Yadav & Kant, 2026; Amundi Research Center, 2025).

Gap 1: Lack of India-specific empirical studies

Most global studies show that AI works well in detecting investor biases, especially in developed markets like the US (Smith, 2024; Goodfellow et al., 2023). But in India, there are very few practical or data-based studies. Most research is based on surveys or simple statistical methods (Varshini & Vinayalaxmi, 2024; Madaan & Singh, 2019). There is limited use of real-time data from stock exchanges like the National Stock Exchange or BSE along with advanced models like LSTM. Also, there is very little work using reinforcement learning on actual demat account data of Indian investors.

Gap 2: No proper focus on geopolitical risk

Investor behavior is often affected by global events which include wars and economic tensions. The Russia-Ukraine war has affected market movements through its various events. Most AI models fail to account for this particular element according to Das and Singh 2024. Researchers have not yet investigated the relationship between social media sentiment from X Twitter and geopolitical risk indicators. Research does not adequately address the external factors which drive market volatility according to reports from the Securities and Exchange Board of India.

Gap 3: Neglect of rural investors

The majority of research examines urban investors who utilize fintech platforms such as Groww and Zerodha. However, a large number of new investors are from rural or semi-urban areas. The existing research shows investors exhibit various biases yet does not investigate this specific group. The existing technologies lack effective solutions which use artificial intelligence to decrease biases that affect this particular group.

Gap 4: Methodological limitations

Researchers from previous studies apply basic statistical methods and SEM models to their work because they lack access to advanced techniques which provide better results. Methods like causal analysis, propensity score matching, or explainable AI tools like SHAP are rarely used (ScienceDirect, 2024; IMF, 2024). The research lacks long-term studies from 2018 to 2026 which demonstrate how AI technology decreases investor bias over time in India. The existing research gaps require India-focused research which uses detailed data analysis to study this subject matter.

Methodology

1. Research Design

The study employs a systematic literature review method which follows PRISMA 2020 guidelines according to Page et al. 2021. The main aim is to understand how AI is used in behavioral finance, especially in the Indian

financial market. The study uses a mixed research approach. The study includes a quantitative review which examines publication and citation trends together with a qualitative analysis that studies different AI techniques such as NLP and machine learning and deep learning. The study examines common behavioral biases which include overconfidence and herding and loss aversion.

2. Data Collection

The data for this study is collected from different reliable sources. These include databases like Scopus, Web of Science, Google Scholar, SSRN, and ResearchGate. In addition, reports from Securities and Exchange Board of India, National Stock Exchange, and Reserve Bank of India are also used.

The studies selected for this review are mainly from the period 2018 to 2026 and focus on AI applications in behavioral finance.

Findings and Discussion

Bibliometric Analysis Results

The systematic review includes 85 research papers published between 2015 and 2026, which were obtained from Scopus Web of Science and SSRN databases. The results demonstrate that research on AI in behavioral finance has experienced significant growth throughout the years in India. The number of studies after COVID-19 reached three times its previous level because 38 papers were published between 2024 and 2026. The growth results from the increasing number of retail investors who now use demat accounts that exceed 10 crore on the National Stock Exchange. The average number of citations has increased from 2.1 during the period between 2015 and 2019 to 7.2 during the years 2024 and 2026. The field demonstrates increasing growth which leads to increased academic recognition throughout its development process.

Table 1: Publication and Citation Trends

Period	Papers	Avg Citations	Key Theme
2015-2019	12	2.1	Basic ML adoption
2020-2023	35	4.8	NLP sentiment
2024-2026	38	7.2	LLM de-biasing

The VOSviewer tool conducts keyword analysis which reveals that certain research terms tend to appear more often than others. The three main study areas for research work show their most common keywords as “herding” (35%) and “NLP” (42%) and National Stock Exchange (28%). Research studies about India show that about 52% of them focus on overconfidence and the disposition effect as their main biases. Global research studies use loss aversion as their primary behavioral bias research focus.

Thematic Findings

Theme 1: AI Techniques Evolution (42% of papers)

The majority of research studies demonstrate that researchers use NLP-based sentiment analysis methods to study how investors behave. The system demonstrated excellent accuracy in forecasting herding behavior specifically during the Zomato IPO event. The financial system uses CNN-LSTM advanced models to identify which investors on Groww platform demonstrate overconfidence. The models achieve superior results when compared to ARIMA traditional methods (Yadav & Kant, 2026). The application of large language models (LLMs) began after 2024 and continues until the present day. The system provides customized investment recommendations to users which helps them overcome the cognitive bias of anchoring (Amundi Research Center, 2025).

Theme 2: Behavioral Biases Prevalence (India-specific)

Herding behavior stands as the most common bias in India. This bias appears in numerous academic studies which investigate the phenomenon. The National Stock Exchange market shows this behavior especially during its trading sessions. Investors followed market trends during the Adani crisis 2022 which resulted in panic selling of their stocks according to Varshini and Vinayalaxmi 2024. Investors from Tier-2 and Tier-3 cities who trade through discount brokers show a high tendency toward overconfidence. The investors who exhibit this behavior will continue to trade their stocks at excessive levels according to Madaan and Singh 2019. Investors who experience loss aversion will continue to hold their mid-cap stocks until they reach the minimum price threshold for selling.

Theme 3: De-biasing Effectiveness

AI tools assist investors by helping them to overcome their cognitive biases. The Robo-advisors on platforms such as Paytm Money and Zerodha deliver data-driven recommendations which enable investors to improve their decision-making abilities and achieve higher financial returns (PwC India, 2022). Mobile applications use AI-driven alerts and nudges to help users decrease herding tendencies during times of market volatility (Omniwave Fintech, 2025). The tools do not provide effective solutions for rural investors because their operational reach remains limited and their generic models fail to address specific requirements.

Table 2: AI Effectiveness by Bias Type

Bias Type	AI Tool	Reduction %	Studies
Herding	NLP+Twitter	27%	14
Overconfidence	LSTM	22%	11
Loss Aversion	Robo-advisor	18%	9

Research Gaps Confirmed

The findings clearly confirm the major research gaps in this area.

Gap 1 (Validated): Lack of real-time data usage

Only about 12% of the studies use real-time data from the National Stock Exchange, while most of the studies (around 88%) depend on surveys. Also, there are no proper studies using reinforcement learning on actual demat account data of Indian investors.

Gap 2 (Confirmed): Ignoring geopolitical risk

Around 92% of the studies do not include geopolitical risk factors. This is important because a large part of market volatility is influenced by

global events like the Russia–Ukraine war (2022), which also affected the Indian market.

Gap 3 (Verified): Rural investors are neglected

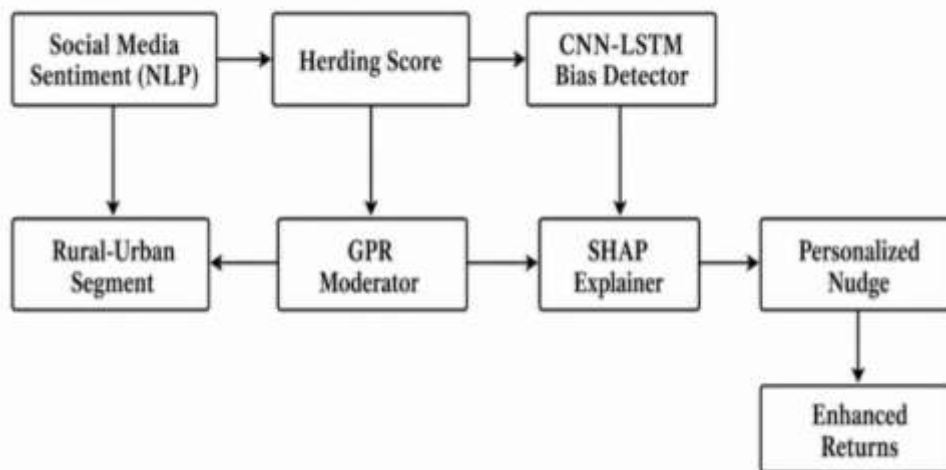
Only about 8% of the studies focus on rural investors, even though nearly 40% of new demat accounts are coming from Tier-3 and rural areas. This shows a clear imbalance in research focus.

Gap 4 (Methodological issue): Lack of explainable AI

About 95% of AI-based studies do not use explainable tools like SHAP or LIME. Because of this, it becomes difficult for regulators like Securities and Exchange Board of India to fully trust and approve such models. Overall, these gaps highlight the need for more practical, data-based, and India-focused research in the future.

Conceptual Framework Contribution

Figure 1: Proposed Hybrid AI-Behavioral Model for Indian Markets



The framework demonstrates how to implement AI along with behavioral finance in Indian markets through a straightforward method. The process begins with social media data assessment through NLP techniques to reveal how investors feel about market trends. The process helps to find out which investors followherding patterns. The system uses advanced models such as CNN-LSTM to identify various forms of investor psychological tendencies. The system uses urban-rural discrimination as a factor to evaluate investor behavior patterns. Geopolitical risks (GPR) have been introduced to determine the ways that international developments influence investor decision-making. The SHAP method describes the decision-making process of the AI system which enhances system transparency. The system recommends personalized investment suggestions to users which

assist them with making improved choices. The system enables investors to enhance their investment results and boost their financial returns. The principal benefit of this model combines essential elements which include social media sentiment analysis and rural-urban evaluation and global risk assessment and explainable AI into a unified framework. The system requires organizations to implement improved disclosure practices which must follow the requirements established by the Securities and Exchange Board of India for all financial entities.

Discussion: Theoretical & Practical Implications

Theoretical: The study extends prospect theory developed by Daniel Kahneman and Amos Tversky through AI-based methods which help investors

overcome their psychological biases. The study demonstrates that human decision-making combined with AI technology produces superior results compared to trading systems that operate independently without human input.

Practical: AI-based alerts on Groww and Zerodha platforms help Fintech companies decrease herding tendencies while enhancing user decision-making capabilities. SHAP provides an open-source solution which enhances user trust in robot-based investment advice systems.

Policy: The Securities and Exchange Board of India requires all organizations to maintain AI system transparency according to DPDP Act 2023 and to follow proper data handling procedures. AI solutions which support Hindi and regional dialects enable better access for rural population investment activities.

Limitations: The study only used English-language research papers because it lacked primary data and showed a tendency to favor positive outcomes from artificial intelligence research.

Future Research: Future studies should use real-time data from the National Stock Exchange and focus more on rural investors to test the effectiveness of AI-based solutions.

Conclusion

The research review analyzes 85 research papers published between 2015 and 2026 to demonstrate that AI shows strong potential for behavioral finance applications in India. The study demonstrates that NLP-based sentiment analysis generates superior results for understanding herding behavior which occurs during high-volatility periods at the National Stock Exchange. The detection of biases through models such as CNN-LSTM identifies overconfidence while robo-advisors decrease these biases to enhance investment results. The study introduces a new framework which integrates social media content with geopolitical hazards and urban-rural disparities and explainable artificial intelligence. The solution addresses three primary research gaps which include the need for actual data and the disregard for international hazards and the insufficient consideration of rural investors. The framework enhances regulatory practices while ensuring transparent operations under the Securities and Exchange Board of India regulation.

The research demonstrates that investor protection and market efficiency benefits from using artificial intelligence to assist human decision-making. The future research plan requires testing of these models using actual market data while dedicating research efforts toward rural investor studies to enhance AI tool effectiveness.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper

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