



ISSN: 2583-7753

LAWFOYER INTERNATIONAL JOURNAL OF DOCTRINAL LEGAL RESEARCH

[ISSN: 2583-7753]

Volume 4 | Issue 1

2026

DOI: <https://doi.org/10.70183/lijdlr.2026.v04.107>

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CONCEPTUAL FOUNDATIONS AND LEGAL FRAMEWORK OF AI IN SECURITIES MARKETS

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I. ABSTRACT

This paper examines the conceptual foundations and legal framework governing the use of Artificial Intelligence in Indian securities markets. It begins by analysing key AI technologies, including machine learning paradigms, algorithmic trading, high-frequency trading, arbitrage mechanisms, and robo-advisory systems, with particular attention to their technical limitations and corresponding legal implications. The paper then situates these technologies within the institutional structure of Indian securities markets, focusing on the roles of stock exchanges, clearing corporations, depositories, and key intermediaries such as brokers and investment advisers. In its final section, the paper undertakes a doctrinal analysis of the statutory and regulatory framework, including the Securities and Exchange Board of India Act, 1992, the Securities Contracts (Regulation) Act, 1956, and key SEBI regulations, alongside the constitutional constraints under Articles 14, 19(1)(g), and 21, and the applicability of the Information Technology Act, 2000. The analysis identifies three structural gaps: the absence of statutory definitions for AI-driven trading practices, the inadequacy of intent-based liability standards in addressing autonomous systems, and the underdeveloped constitutional jurisprudence governing AI regulation in securities markets. The paper argues for a calibrated regulatory approach that balances innovation with investor protection and market integrity.

II. KEYWORDS

Algorithmic Trading; SEBI Act; Market Manipulation; Artificial Intelligence; Securities Regulation

III. INTRODUCTION

The regulation of securities markets has historically been premised on the actions and intentions of human actors. The legal concepts of fraud, manipulation, insider trading,

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and fiduciary duty were developed in an era when trading decisions were made by identifiable individuals exercising human judgment. The advent of Artificial Intelligence (AI) and algorithmic trading has fundamentally altered this landscape. Today, a significant and growing proportion of securities transactions in India are executed by automated systems operating at speeds and complexities that far exceed human capabilities.

It is organised into three broad sections. Section A examines the technical concepts of AI, machine learning, algorithmic trading, high-frequency trading (HFT), arbitrage, and robo-advisory services, with particular attention to the legal implications of their technical limitations. Section B surveys the structure and functioning of Indian securities markets. Section C provides a systematic analysis of the statutory and regulatory framework governing Indian securities markets, including the constitutional dimensions and the applicability of information technology law to AI-driven systems. Together, these sections establish the foundational architecture upon which the subsequent research analyse the specific legal problems of algorithmic trading, arbitrage, and investor protection.

A. Research Objectives

The paper pursues three principal objectives:

1. To examine the technical architecture of AI-driven trading systems and identify their legally relevant characteristics.
2. To analyse the adequacy of the existing Indian securities law framework in addressing risks arising from algorithmic and AI-based trading practices.
3. To evaluate the constitutional implications of regulating AI in securities markets, particularly in relation to equality, proportionality, and procedural fairness.

B. Research Questions

The paper is guided by the following questions:

1. Does the existing statutory framework under the SEBI Act, 1992 and allied regulations adequately address the attribution of intent in AI-driven market manipulation?
2. To what extent do constitutional principles, particularly under Articles 14, 19(1)(g), and 21, constrain or shape regulatory interventions in algorithmic trading?
3. Whether current regulatory approaches sufficiently mitigate systemic and investor protection risks arising from AI-driven trading systems?

C. Research Methodology

The paper adopts a doctrinal legal research methodology based on the analysis of primary sources, including statutes, SEBI regulations, and constitutional provisions, supplemented by regulatory circulars and consultation papers. It also employs a limited comparative approach by referring to developments in jurisdictions such as the European Union and the United States to contextualise gaps in the Indian framework.

IV. CONCEPTUAL FOUNDATIONS OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES AND THEIR LEGAL IMPLICATIONS

A. Artificial Intelligence and Machine Learning: Definitions and Typology

Artificial Intelligence, as a concept, broadly refers to the capability of computer systems to perform tasks that would ordinarily require human intelligence, including perception, reasoning, learning, problem-solving, and decision-making.² In the context of securities regulation, AI is primarily encountered as a set of computational techniques that enable trading systems, surveillance tools, and advisory platforms to process vast quantities of financial data and act upon it with minimal human intervention.

² Russell, S. J. and Norvig, P., *Artificial Intelligence: A Modern Approach*, 4th ed. (Pearson, 2020), p. 1.

Machine learning (ML), a sub-field of AI, enables systems to learn from data and improve their performance on specific tasks without being explicitly programmed for each scenario.³ Within securities markets, three principal paradigms of machine learning are operationally relevant.

B. Supervised Learning

Supervised learning involves training an algorithm on a labelled dataset i.e., a dataset where the desired output is already known so that the model can predict outcomes for new, unseen data.⁴ In securities applications, supervised learning is used for credit scoring, fraud detection, and predicting asset price movements based on historical patterns. The legal significance of supervised learning lies in the quality of the training data: if historical data reflects biased pricing or discriminatory practices, the model will perpetuate those biases, raising concerns under the equality guarantee of Article 14 of the Constitution of India and investor protection obligations under the SEBI Act, 1992.

C. Unsupervised Learning

Unsupervised learning involves identifying hidden patterns or intrinsic structures in unlabelled data without predefined output variables.⁵ In market surveillance, unsupervised clustering algorithms are deployed to detect unusual trading patterns that may indicate coordinated manipulation or insider trading. The challenge for regulators is that the patterns identified by such algorithms are not always interpretable by human analysts, raising questions about the evidentiary value of AI-generated surveillance alerts in enforcement proceedings before the Securities Appellate Tribunal (SAT).

D. Reinforcement Learning

Reinforcement learning is a paradigm in which an agent learns optimal behaviour by receiving rewards or penalties based on the outcomes of its actions in an

³ Mitchell, T. M., *Machine Learning* (McGraw-Hill, 1997), p. 2.

⁴ Hastie, T., Tibshirani, R. and Friedman, J., *The Elements of Statistical Learning*, 2nd ed. (Springer, 2009), p. 9.

⁵ *Ibid.*, p. 485.

environment.⁶ High-frequency trading systems that dynamically adapt their order-submission strategies in response to real-time market feedback represent a prominent application of reinforcement learning. The legal challenge is acute: reinforcement learning systems can develop emergent strategies that were not anticipated by their designers, complicating the attribution of intent- a requirement for establishing market manipulation under Section 12A of the SEBI Act, 1992, and Regulation 4 of the SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.

V. ALGORITHMIC TRADING: DEFINITION AND OPERATIONAL MECHANISMS

Algorithmic trading refers to the use of computer programs that follow a defined set of instructions to place trades with the objective of generating profits at a speed and frequency that is impossible for a human trader.⁷ SEBI defines algorithmic trading (algo trading) as any order that is generated using automated execution logic.⁸

The operational mechanism of an algorithmic trading system involves four stages: (i) data ingestion, in which the system receives market data feeds, news inputs, and other relevant information; (ii) signal generation, where the algorithm processes the data against pre-programmed criteria to produce a trade signal; (iii) order generation, where the trading signal is translated into a specific order in terms of instrument, quantity, price, and timing; and (iv) order transmission, where the order is electronically routed to the exchange.⁹

SEBI introduced the regulatory framework for algorithmic trading in India through its Circular of March 30, 2012, which established requirements for risk controls, audit trails, and real-time monitoring.¹⁰ Subsequent circulars have progressively expanded and refined these obligations. The 2025 Consultation Paper on Responsible Usage of AI/ML in Indian Securities Markets marks the most recent effort to address the

⁶ Sutton, R. S. and Barto, A. G., *Reinforcement Learning: An Introduction*, 2nd ed. (MIT Press, 2018), p. 1.

⁷ Algorithmic Trading Advisory, SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012.

⁸ *Ibid.*, para 1

⁹ Aldridge, I., *High-Frequency Trading: A Practical Guide to Algorithmic Strategies and Trading Systems*, 2nd ed. (Wiley, 2013), p. 3.

¹⁰ SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012.

specific challenges posed by AI-driven algo trading systems that go beyond rule-based execution logic.¹¹

VI. HIGH-FREQUENCY TRADING: LEGAL DISTINCTION FROM CONVENTIONAL ALGORITHMIC TRADING

High-Frequency Trading (HFT) is a subset of algorithmic trading characterised by an extremely high speed of order submission, a very large number of orders, a short holding period for positions, and the submission and cancellation of a large number of orders.¹² While all HFT is algorithmic, not all algorithmic trading qualifies as HFT; the distinction is material for regulatory purposes.

The principal legal distinction between conventional algorithmic trading and HFT lies in three dimensions. First, speed: HFT systems operate in microsecond or nanosecond timeframes, exploiting co-location facilities at exchanges to minimise latency. SEBI has regulated co-location services through its Circular of May 13, 2015, following the NSE co-location controversy in which certain brokers were alleged to have obtained preferential access to the trading system.¹³ Second, order-to-trade ratios: HFT is characterised by a high ratio of orders submitted to orders actually executed, which can contribute to order book congestion and create a false impression of market depth. Third, market impact: the speed and volume of HFT can contribute to flash crashes- sudden, deep, and rapid price movements- as witnessed in global markets.¹⁴

From a regulatory standpoint, the opacity of HFT strategies makes it difficult to apply the standard definitional elements of market manipulation under Section 15HA of the SEBI Act, 1992, which requires proof of an act that creates a false or misleading appearance of trading.¹⁵ Whether an HFT strategy that consistently captures the bid-

¹¹ SEBI, Consultation Paper on Responsible Usage of AI/ML in Indian Securities Markets (2025), available at www.sebi.gov.in.

¹² European Securities and Markets Authority (ESMA), Guidelines on Systems and Controls in an Automated Trading Environment for Trading Platforms, Investment Firms and Competent Authorities (ESMA/2012/122), p. 7.

¹³ SEBI, Report of the Committee on Algorithmic Trading, November 2016; SEBI Circular No. CIR/MRD/DP/10/2015 dated 13 May 2015.

¹⁴ Kirilenko, A. A. et al., "The Flash Crash: High Frequency Trading in an Electronic Market" (2017) 72(3) Journal of Finance 967.

¹⁵ Section 15HA, SEBI Act, 1992 (inserted by the SEBI (Amendment) Act, 2002, w.e.f. 29-10-2002; penalty quantum substituted by the Securities Laws (Amendment) Act, 2014, w.e.f. 08-02-2014).

ask spread through latency arbitrage constitutes a legitimate market-making activity or an unfair trade practice under Regulation 4(2)(a) of the PFUTP Regulations remains a contested legal question.

VII. ARBITRAGE MECHANISMS: SPATIAL, TEMPORAL, AND STATISTICAL ARBITRAGE

Arbitrage, in its classical economic formulation, refers to the simultaneous purchase and sale of an asset in different markets to profit from a price discrepancy, without bearing market risk.¹⁶ In contemporary AI-driven securities markets, arbitrage takes several distinct forms, each with differing legal implications.

A. Spatial Arbitrage

Spatial arbitrage exploits price differentials for the same security across different exchanges or trading venues. In India, where the same equity shares may be listed on the National Stock Exchange (NSE), the BSE, and as underlying instruments for Exchange Traded Funds (ETFs), spatial arbitrage opportunities arise when prices momentarily diverge. AI systems can detect and exploit these discrepancies in microseconds. Such activity is generally regarded as beneficial, as it promotes price convergence and market efficiency. However, when conducted through manipulative means for instance, by placing large orders on one exchange to artificially create a price differential that the system simultaneously exploits on another it may constitute a fraudulent and unfair trade practice under the PFUTP Regulations, 2003.¹⁷

B. Temporal Arbitrage

Temporal arbitrage exploits price differences that exist across time rather than across space i.e., it involves buying an asset at a lower price at one point in time with the expectation of selling it at a higher price at a later (though often very short) time, based on AI-driven predictive models. The legal difficulty is that the line between permissible speculative trading and unlawful price manipulation can become blurred when AI systems are capable of self-fulfilling predictions: a sufficiently large and fast

¹⁶ Shleifer, A. and Vishny, R. W., "The Limits of Arbitrage" (1997) 52(1) *Journal of Finance* 35.

¹⁷ Regulation 4(2), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.

system can, by trading on its own price prediction, cause the predicted price movement to occur, raising the question of whether this constitutes market manipulation by artifice within the meaning of Regulation 4(2)(b) of the PFUTP Regulations, 2003.¹⁸

C. Statistical Arbitrage

Statistical arbitrage (stat-arb) relies on quantitative models to identify pricing anomalies among a portfolio of related securities, exploiting mean-reversion tendencies.¹⁹ It does not involve a riskless profit; instead, it seeks to exploit statistical regularities that the model predicts will persist. The legal significance of statistical arbitrage lies primarily in its potential to contribute to correlated market movements that can amplify systemic risk. When multiple AI systems are trained on the same datasets and converge on the same statistical arbitrage strategies, their simultaneous execution can cause herding behaviour that destabilises markets- a concern that the current SEBI regulatory framework does not specifically address.

VIII. ROBO-ADVISORS AND AUTOMATED INVESTMENT ADVISORY SERVICES

Robo-advisors are digital platforms that provide automated, algorithm-driven financial planning and investment advisory services, with minimal human supervision.²⁰ They typically collect information about a client's financial situation, risk tolerance, and investment goals through an online questionnaire, and then use algorithmic models to construct and manage a portfolio of assets.

In India, investment advisory services are regulated under the SEBI (Investment Advisers) Regulations, 2013 (IA Regulations). The IA Regulations impose obligations of suitability assessment, disclosure, and fiduciary conduct on registered investment advisers.²¹ The question of whether and how these obligations apply to automated

¹⁸ Regulation 4(2)(b), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.

¹⁹ Avellaneda, M. and Lee, J. H., "Statistical Arbitrage in the US Equities Market" (2010) 10(4) Quantitative Finance 761.

²⁰ Consultation Paper on Amendments/Clarifications to the SEBI (Investment Advisers) Regulations, 2013 (2016), p. 1.

²¹ Regulation 17, SEBI (Investment Advisers) Regulations, 2013.

robo-advisory platforms presents significant legal challenges. SEBI published a Consultation Paper on Robo-Advisory Services in 2016, acknowledging that robo-advisors must comply with the IA Regulations but leaving open several questions about algorithmic suitability assessment, liability for automated advice, and grievance redressal.²²

The principal legal concerns with robo-advisors relate to: (i) suitability- whether an algorithm can adequately assess a client's risk appetite and financial circumstances; (ii) disclosure-whether the client is adequately informed that their portfolio is being managed by an algorithm; (iii) accountability- who bears legal liability when an automated advisory recommendation causes financial loss; and (iv) systemic risk, whether the widespread adoption of similar robo-advisory models creates correlated behaviour that amplifies market volatility.²³

IX. TECHNICAL LIMITATIONS OF AI SYSTEMS AND THEIR LEGAL IMPLICATIONS

The technical limitations of AI systems in securities markets are not merely engineering concerns; they carry direct and significant legal implications for the adequacy of existing regulatory frameworks. Four limitations merit specific doctrinal examination.

A. Black-Box Opacity and Lack of Explainability

Many advanced AI systems, particularly those using deep learning architectures, operate as "black boxes": the internal processes by which they arrive at a particular output cannot be readily explained in human-understandable terms²⁴. This opacity poses fundamental challenges for securities regulation, which is built upon principles of transparency, accountability, and the attribution of intent.

²² Consultation Paper on Amendments/Clarifications to the SEBI (Investment Advisers) Regulations, 2013 (2016), para 3.

²³ Baker, T. and Dellaert, B., "Regulating Robo Advice Across the Financial Services Industry" (2018) 103 Iowa Law Review 713, at 717.

²⁴ Pasquale, F., *The Black Box Society: The Secret Algorithms That Control Money and Information* (Harvard University Press, 2015), p. 3.

Under Section 12A of the SEBI Act, 1992, and the PFUTP Regulations, 2003, the establishment of a fraudulent or unfair trade practice requires proof that the impugned conduct was engaged in knowingly or with intent to deceive. Where an AI system produces a trading outcome that appears manipulative, it may be impossible to demonstrate that the algorithm acted with the requisite *mens rea*, as it has no subjective intention.²⁵ Equally, in enforcement proceedings, the SEBI cannot compel disclosure of the internal logic of a proprietary trading algorithm without robust legal authority, and such disclosure may be resisted on grounds of trade secrecy under Section 72 of the Information Technology Act, 2000.

The European Union's General Data Protection Regulation (GDPR) under Article 22 establishes a right not to be subject to solely automated decision-making with legal or similarly significant effects, along with associated safeguards such as the ability to seek human intervention. While often described in academic literature as embodying a "right to explanation," this characterisation remains doctrinally contested, as noted by Goodman and Flaxman. Nevertheless, it is widely treated as a benchmark for AI transparency obligations. No comparable provision exists in Indian securities law, and this lacuna represents a significant regulatory gap.²⁶

B. Data Dependency and Garbage-In-Garbage-Out Risk

AI models are only as reliable as the data on which they are trained. If training data is incomplete, unrepresentative, or manipulated, the model's outputs will be systematically skewed.²⁷ In securities markets, this risk manifests in at least two legally relevant ways. First, if the historical trading data used to train an AI surveillance system contains patterns of manipulation that were never detected or prosecuted, the system may learn to treat manipulative patterns as normal, effectively legitimising unlawful conduct. Second, if an AI trading system relies on alternative data sources, such as social media sentiment, satellite imagery, or web-scraped

²⁵ Section 12A, SEBI Act, 1992; Regulation 3, SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.

²⁶ Goodman, B. and Flaxman, S., "European Union Regulations on Algorithmic Decision-Making and a Right to Explanation" (2017) 38(3) *AI Magazine* 50.

²⁷ Mehrabi, N. et al., "A Survey on Bias and Fairness in Machine Learning" (2021) 54(6) *ACM Computing Surveys* 1.

information questions arise about whether such data constitutes material non-public information (MNPI), the use of which would amount to insider trading under Regulation 4 of the SEBI (Prohibition of Insider Trading) Regulations, 2015 (PIT Regulations).²⁸

C. Algorithmic Bias and Discriminatory Outcomes

Algorithmic bias refers to the systematic and unjustifiable differences in AI outputs across different groups of users or market participants, typically arising from biased training data or flawed model design.²⁹ In the context of retail investor-facing AI services such as robo-advisors, algorithmic bias could result in systematically inferior portfolio recommendations for investors from particular demographic groups. This would raise issues under Article 14 of the Constitution of India, which guarantees equality before law, and under the investor protection mandate of Section 11(2)(g) of the SEBI Act, which requires SEBI to protect the interests of investors in securities.

D. Systemic Risk and Feedback Loops

When a large number of AI systems are trained on similar datasets and employ similar strategies, their simultaneous actions in response to the same market signals can create dangerous feedback loops that amplify volatility and potentially destabilise markets.³⁰ The Flash Crash of May 6, 2010, in the United States, and similar episodes in other markets, have demonstrated the capacity of automated trading systems to cause rapid and severe market dislocations. The Indian regulatory framework does not currently contain provisions specifically designed to address AI-generated systemic risk, though SEBI's circuit breaker mechanisms and market-wide position limits provide partial mitigation.

X. STRUCTURE AND FUNCTIONING OF INDIAN SECURITIES MARKETS

A. Market Infrastructure: Exchanges, Clearing Corporations, and Depositories

²⁸ Regulation 4, SEBI (Prohibition of Insider Trading) Regulations, 2015.

²⁹ Mehrabi et al. (n 26), p. 2.

³⁰ Financial Stability Board, *Artificial Intelligence and Machine Learning in Financial Services: Market Developments and Financial Stability Implications* (November 2017), p. 43.

The Indian securities market infrastructure is constituted by three layers of institutional architecture: stock exchanges, clearing corporations, and depositories. Together, these entities form the operational backbone within which AI-driven trading activities occur.

B. Stock Exchanges

Stock exchanges provide the organised platform upon which securities are listed and traded. In India, the principal stock exchanges are the National Stock Exchange of India Limited (NSE) and the BSE Limited (formerly Bombay Stock Exchange).³¹ Both are recognised stock exchanges under Section 4 of the Securities Contracts (Regulation) Act, 1956 (SCRA). SEBI exercises regulatory oversight over recognised stock exchanges by virtue of Section 11 of the SEBI Act, 1992, and the SEBI (Stock Exchanges and Clearing Corporations) Regulations, 2018.³²

From the perspective of AI regulation, stock exchanges play a critical role as front-line regulators. The NSE and BSE operate real-time surveillance systems that are required to detect market manipulation, spoofing, and layering. SEBI has mandated that exchanges provide co-location services on a fair, transparent, and non-discriminatory basis, following the NSE co-location scam, in which certain HFT operators were alleged to have received preferential access to the exchange's trading engine.³³ The technical capacity of exchange surveillance systems to detect AI-driven manipulation is a question that bears directly on the effectiveness of the broader regulatory framework.

C. Clearing Corporations

Clearing corporations are responsible for the post-trade functions of clearing and settlement of trades executed on the exchange. In India, the NSE Clearing Limited (formerly National Securities Clearing Corporation Limited, NSCCL) and the Indian

³¹ Section 4, Securities Contracts (Regulation) Act, 1956.

³² Section 11(1), SEBI Act, 1992; SEBI (Stock Exchanges and Clearing Corporations) Regulations, 2018.

³³ SEBI, Show Cause Notice in the Matter of NSE Co-location Case (2019); SAT Order in the Matter of NSE Algorithmic Trading Case.

Clearing Corporation Limited (ICCL) are the principal clearing entities.³⁴ Clearing corporations act as central counterparties to all trades, thereby eliminating counterparty risk. The legal framework governing clearing corporations is contained in the SEBI (Stock Exchanges and Clearing Corporations) Regulations, 2018.

The relevance of clearing corporations to AI-driven trading lies in their risk management functions. The real-time margin collection and exposure monitoring systems operated by clearing corporations serve as an important check on the systemic risk generated by high-frequency and algorithmic traders. However, these systems are themselves increasingly AI-driven, raising questions about the reliability of AI-supervised risk management.

D. Depositories

Depositories hold securities in electronic (dematerialised) form on behalf of investors. The two depositories in India are the National Securities Depository Limited (NSDL) and the Central Depository Services (India) Limited (CDSL), regulated under the Depositories Act, 1996, and the SEBI (Depositories and Participants) Regulations, 2018.³⁵ While depositories do not directly participate in the trading process, they are critical to the integrity of the settlement mechanism. AI-driven analytics are increasingly deployed by depositories to detect beneficial ownership patterns that may indicate insider trading or fraudulent transfer of securities.

XI. MARKET PARTICIPANTS AND INTERMEDIARIES

Securities market participants span a broad spectrum, from individual retail investors to large institutional entities. From a regulatory standpoint, the most significant categories of intermediaries in the context of AI-driven trading are stockbrokers, investment advisers, and portfolio managers.

A. Stockbrokers

³⁴ NSE Clearing Limited, established under the SEBI (Stock Exchanges and Clearing Corporations) Regulations, 2018.

³⁵ Section 3, Depositories Act, 1996; SEBI (Depositories and Participants) Regulations, 2018.

Stockbrokers are the primary intermediaries through whom investors access the exchange trading mechanism. They are registered with SEBI under the SEBI (Stockbrokers) Regulations, 1992, and are required to maintain specified net worth requirements, comply with Know Your Client (KYC) norms, and adhere to the Code of Conduct prescribed in Schedule II to those Regulations.³⁶

In the context of algorithmic trading, stockbrokers occupy a position of critical regulatory significance. SEBI's 2012 Algo Trading Circular placed the primary responsibility for ensuring risk controls and compliance upon the stockbroker through whose infrastructure the algorithmic trading occurs. Brokers are required to obtain approval from the exchange before deploying any algorithmic trading system, maintain logs of all orders generated by algorithms, and conduct system audits. The legal question of whether a broker can discharge these obligations in respect of a sophisticated, self-adapting AI trading system that behaves differently from its originally approved configuration is a significant gap in the current regulatory framework.³⁷

B. Investment Advisers

Investment advisers provide personalised advice on the merits of investing in, purchasing, selling, or dealing in securities. They are registered under the SEBI (Investment Advisers) Regulations, 2013, and are subject to fiduciary obligations, suitability assessment requirements, and comprehensive disclosure obligations.³⁸ The emergence of robo-advisory platforms has created regulatory uncertainty as to whether the IA Regulations were designed to, and adequately do, accommodate automated advice delivery, particularly in respect of the suitability obligation and the requirement for the adviser to act in the best interest of the client.

C. Portfolio Managers

Portfolio managers exercise discretionary or non-discretionary management of securities portfolios on behalf of clients and are registered under the SEBI (Portfolio

³⁶ Schedule II, Code of Conduct, SEBI (Stockbrokers) Regulations, 1992.

³⁷ SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012, paras 2-4.

³⁸ Regulation 15, 17 and 19, SEBI (Investment Advisers) Regulations, 2013.

Managers) Regulations, 2020.³⁹ AI-driven quantitative portfolio management strategies, including those employing statistical arbitrage and factor-based models, are increasingly common. The applicability of the fiduciary and disclosure obligations under the Portfolio Manager Regulations to AI-driven investment processes raises issues analogous to, though distinct from, those arising in the context of robo-advisory services.

XII. TRADING MECHANISMS AND ORDER EXECUTION SYSTEMS

The Indian securities market operates on an electronic, order-driven, anonymous, continuous auction mechanism. Orders submitted by participants are matched against each other by the exchange's trading engine according to price-time priority.⁴⁰ The principal types of orders include market orders, limit orders, stop-loss orders, and immediate-or-cancel (IOC) orders, each of which is capable of automated generation and submission by algorithmic trading systems.

The order management systems (OMS) and execution management systems (EMS) deployed by brokers and trading firms are the conduits through which algorithmic trading orders flow. SEBI has mandated minimum technical requirements for these systems, including automated risk parameters such as price bands, order value limits, and quantity limits, which are required to be pre-configured at the broker level to prevent erroneous algorithmic orders from causing market disruption.⁴¹ The adequacy of these pre-trade risk controls in the face of advanced AI systems capable of generating thousands of orders per second is a recurring theme in the subsequent analysis.

XIII. LEGAL FRAMEWORK GOVERNING INDIAN SECURITIES MARKETS

A. The Securities and Exchange Board of India Act, 1992

³⁹ Regulation 21, SEBI (Portfolio Managers) Regulations, 2020.

⁴⁰ NSE, Market Microstructure and Order Matching, available at www.nseindia.com.

⁴¹ SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012, Annexure A.

The Securities and Exchange Board of India Act, 1992 (SEBI Act) is the principal legislation governing securities regulation in India. It establishes SEBI as the primary regulatory authority and endows it with a comprehensive range of powers that are critical to any analysis of AI regulation in securities markets.

1. Section 11: Powers and Functions of SEBI

Section 11 of the SEBI Act confers upon SEBI the mandate to protect the interests of investors in securities and to promote the development of, and to regulate, the securities market by such measures as it thinks fit.⁴² Section 11(2) enumerates specific functions, including the regulation of stock exchanges and intermediaries, registration and regulation of investment advisers, and the promotion of investor education.

The phrase "such measures as it thinks fit" in Section 11(1) confers broad rule-making discretion upon SEBI, which is the legal basis for its regulatory circulars and consultation papers addressing algorithmic trading and AI. However, it is a settled principle of Indian administrative law that delegated legislative power must be exercised within the framework of the parent statute, and regulatory measures that impose criminal liability or that restrict fundamental rights must conform to the standard of proportionality.⁴³

2. Section 12A: Prohibition of Fraudulent and Unfair Trade Practices

Section 12A of the SEBI Act prohibits any investors or directly or indirectly engaging in the purchase or sale of securities through a fraudulent scheme, employing a device or artifice to defraud investors, or engaging in transactions that create a false or misleading appearance of trading.⁴⁴ This provision is substantially modelled on Rule 10b-5 under the United States Securities Exchange Act of 1934 and constitutes the centrepiece of SEBI's market integrity framework.

The application of Section 12A to AI-driven trading is problematic in at least two respects. First, "device or artifice" and "fraudulent scheme" carry a connotation of intentional deception, which is conceptually inapposite to an autonomous AI system

⁴² Section 11(1), SEBI Act, 1992.

⁴³ *Modern Dental College and Research Centre v. State of Madhya Pradesh* (2016) 7 SCC 353, para 42.

⁴⁴ Section 12A(a), (b) and (c), SEBI Act, 1992 (inserted by Securities Laws (Amendment) Act, 2002).

that produces a manipulative market outcome as an emergent property of its optimisation function, without any human actor consciously intending that result. Second, the attribution of liability under Section 12A, whether to the AI developer, the deploying firm, the broker, or the investor is not resolved by the statute or by any judicial precedent under Indian securities law.

3. Section 15HA: Market Manipulation

Section 15HA of the SEBI Act imposes a penalty on any person who indulges in fraudulent and unfair trade practices relating to securities.⁴⁵ The section is a penalty provision that operates alongside Section 12A and is subject to the adjudication process under Sections 15-I and 15-J of the Act. The jurisprudence of the Securities Appellate Tribunal under Section 15HA demonstrates that SEBI has frequently proceeded against market participants for layering and spoofing practices that are overwhelmingly conducted through algorithmic systems but has done so by imputing the intent of the human operator behind the algorithm. As algorithmic systems become more autonomous, this imputation becomes legally fragile.

4. Investor Protection Mandate

The investor protection mandate pervades the SEBI Act. Section 11(2)(g) specifically requires SEBI to "prohibit insider trading in securities" and Section 11(2)(j) requires it to "perform such functions and exercise such powers" as may be delegated to it by the Central Government. Section 30 empowers SEBI to make regulations for investor protection.⁴⁶ In the context of AI, the investor protection mandate requires examination in relation to the adequacy of disclosure requirements for AI-driven advisory and portfolio management services and the accessibility of grievance redressal mechanisms for retail investors harmed by AI-driven market manipulation.

B. Securities Contracts (Regulation) Act, 1956

The Securities Contracts (Regulation) Act, 1956 (SCRA) predates the SEBI Act and provides the foundational framework for the recognition and regulation of stock

⁴⁵ Section 15HA, SEBI Act, 1992 (inserted by the SEBI (Amendment) Act, 2002, w.e.f. 29-10-2002; penalty quantum substituted by the Securities Laws (Amendment) Act, 2014, w.e.f. 08-02-2014).

⁴⁶ Section 11(2)(g) and 11(2)(j), SEBI Act, 1992.

exchanges and the validity of contracts in securities.⁴⁷ Section 16 of the SCRA empowers the Central Government to prohibit contracts in securities if it is satisfied that it is necessary or expedient so to do in the interest of the trade or the public interest.

The SCRA's definition of "securities" in Section 2(h) is pivotal for determining the regulatory perimeter of AI-driven trading. The definition includes shares, bonds, debentures, units of collective investment schemes, rights or interests in securities, and derivatives.⁴⁸ The question of whether certain AI-generated financial instruments or tokenised assets fall within this definition has not been authoritatively resolved and may require legislative clarification as financial innovation accelerates. Further, Section 13 of the SCRA, which renders contracts in securities void if made in contravention of the provisions of the Act, has potential applicability to trades generated by algorithmic systems that violate regulatory requirements a question that requires examination in the context of whether void trades can be reversed and how corresponding settlement obligations are to be discharged.

XIV. KEY SEBI REGULATIONS AND THEIR APPLICATION TO AI-DRIVEN TRADING

A. SEBI (Prohibition of Insider Trading) Regulations, 2015

The SEBI (Prohibition of Insider Trading) Regulations, 2015 (PIT Regulations) prohibit any person in possession of unpublished price sensitive information (UPSI) from trading in the securities to which such information relates⁴⁹. The advent of AI systems capable of analysing alternative data satellite images of factory parking lots, shipping container movements, electricity consumption data, social media sentiment has created a category of information that does not fit neatly within the conventional definition of UPSI but that can provide AI systems with a trading advantage equivalent to MNPI.

⁴⁷ Preamble, Securities Contracts (Regulation) Act, 1956.

⁴⁸ Section 2(h), Securities Contracts (Regulation) Act, 1956.

⁴⁹ Regulations 3 and 4, SEBI (Prohibition of Insider Trading) Regulations, 2015.

The PIT Regulations define UPSI to include any information relating to a company that is not generally available and which upon becoming generally available, is likely to materially affect the price of securities.⁵⁰ Whether AI-derived insights from alternative data sources constitute UPSI remains unresolved in Indian law. By contrast, the United States Securities and Exchange Commission (SEC) has issued guidance suggesting that alternative data may constitute material non-public information in certain circumstances, and the Regulation FD framework imposes obligations on companies to ensure that selective disclosure does not create information asymmetries.⁵¹ The absence of equivalent clarity in India is a regulatory gap that directly enables AI-driven information arbitrage.

B. SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003

The SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003 (PFUTP Regulations) elaborate upon the prohibition in Section 12A of the SEBI Act and enumerate specific practices that constitute fraud or market manipulation.⁵² Regulation 4(2) lists illustrative manipulative practices including: creating a false or misleading appearance of trading in securities (Reg. 4(2)(a)); affecting the price of securities by a series of transactions that are not real trades (Reg. 4(2)(b)); price manipulation through the use of electronic media or other means (Reg. 4(2)(e)); and disseminating information that is misleading (Reg. 4(2)(f)).

The application of these provisions to AI-driven trading requires a contextual re-reading. Spoofing the placement of large orders with the intention of cancelling them before execution to induce others to trade at manipulated prices falls squarely within Regulation 4(2)(b) when conducted by human traders. When conducted by an AI system, the "intent" element is supplied by the programming of the algorithm, and SEBI has held in several orders that the intent of the algorithmic operator may be inferred from the pattern of orders. However, this reasoning becomes strained in the

⁵⁰ Regulation 2(1)(n), SEBI (Prohibition of Insider Trading) Regulations, 2015.

⁵¹ SEC, Statement on Certain Uses of Alternative Data (2021), available at www.sec.gov.

⁵² Regulation 4(2), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.

case of self-learning AI systems whose strategies evolve beyond the original programming.⁵³

C. SEBI (Stockbrokers) Regulations, 1992

The SEBI (Stockbrokers) Regulations, 1992, regulate the conduct of stockbrokers, who are the primary regulated entities responsible for algorithmic trading compliance. The Code of Conduct in Schedule II to these Regulations requires brokers to act with due skill, care, and diligence and to maintain adequate records.⁵⁴ In the context of algorithmic trading, these conduct obligations require examination in relation to the broker's duty to understand, monitor, and control the AI trading systems deployed through its infrastructure, a duty that becomes increasingly difficult to discharge as the systems become more autonomous and opaquer.

D. SEBI (Investment Advisers) Regulations, 2013

The SEBI (Investment Advisers) Regulations, 2013 (IA Regulations) require all persons providing investment advice in India to register with SEBI and comply with fiduciary obligations, qualification requirements, suitability norms, and disclosure requirements.⁵⁵ The fiduciary duty under Regulation 17 requires an investment adviser to act in a manner consistent with the best interests of the client. For robo-advisors, the question is whether an algorithm can act as a fiduciary a role traditionally understood to require human judgment, loyalty, and the capacity for contextual moral reasoning. This question is not addressed in the IA Regulations and has not been directly considered by any Indian court.

XV. CONSTITUTIONAL FRAMEWORK

The regulation of AI in securities markets must be examined within the framework of the Constitution of India, which sets the outer limits of legislative and executive power and protects individual rights against State action. Three constitutional provisions are of particular relevance.

⁵³ See, e.g., SEBI Order in Re: Shailesh Babulal Shah (2018); SEBI Order in Re: Nikhil Vora (2017).

⁵⁴ Schedule II, Code of Conduct, SEBI (Stockbrokers) Regulations, 1992, cl. A (1) and A (3).

⁵⁵ Regulation 15(1), SEBI (Investment Advisers) Regulations, 2013.

A. Article 14: Equality Before Law

Article 14 of the Constitution guarantees equality before law and equal protection of laws to all persons.⁵⁶ In the context of securities regulation, Article 14 requires that regulatory measures affecting market participants not be arbitrary, discriminatory, or unreasonable. Two AI-related issues arise under Article 14. First, any regulatory framework that imposes obligations on AI-deploying entities that are not proportionate to the risks posed, or that discriminates between similarly situated algorithmic traders without rational basis, would be vulnerable to challenge under Article 14. Second, the unequal access to co-location services and low-latency infrastructure which enables HFT firms to systematically outperform retail investors raises questions about whether the regulatory framework's tolerance of such structural asymmetry is consistent with the equal protection guarantee, as interpreted in the context of market regulation.⁵⁷

B. Article 19(1)(g): Freedom to Practise Any Trade or Profession

Article 19(1)(g) guarantees every citizen the right to practise any profession, or to carry on any occupation, trade, or business.⁵⁸ Regulatory restrictions on algorithmic trading, such as requirements for prior approval of trading algorithms, mandatory disclosure of algorithmic strategies, or outright prohibition of certain AI-driven trading practices, constitute restrictions on the right guaranteed under Article 19(1)(g) and must, pursuant to Article 19(6), be reasonable restrictions in the interests of the general public. The proportionality of any regulatory intervention that restricts AI-driven trading must be assessed against the objectives of market integrity and investor protection. The Supreme Court of India's jurisprudence on the doctrine of proportionality, as articulated in *Modern Dental College and Research Centre v. State of Madhya Pradesh*,⁵⁹ provides the framework for this assessment.

C. Article 21: Procedural Due Process

⁵⁶ Article 14, Constitution of India.

⁵⁷ See *Cellular Operators Association of India v. TRAI* (2016) 7 SCC 703 (proportionality review of regulatory restrictions on market participants).

⁵⁸ Article 19(1)(g), Constitution of India.

⁵⁹ *Modern Dental College and Research Centre v. State of Madhya Pradesh* (2016) 7 SCC 353.

Article 21 of the Constitution guarantees that no person shall be deprived of life or personal liberty except according to procedure established by law, which the Supreme Court in *Maneka Gandhi v. Union of India*⁶⁰ has interpreted to require a just, fair, and reasonable procedure. In the context of SEBI enforcement proceedings against algorithmic traders, Article 21 requires that the procedure adopted including the evidentiary standards applied to AI-generated surveillance data, the right to cross-examine expert witnesses, and the right to have the basis of the algorithmic surveillance analysis explained - be fair and non-arbitrary. The use of proprietary AI-based surveillance systems whose methodology is not disclosed to the accused in enforcement proceedings may raise procedural due process concerns that have not yet been litigated before Indian courts.

XVI. APPLICABILITY OF THE INFORMATION TECHNOLOGY ACT, 2000 TO AI SYSTEMS IN SECURITIES MARKETS

The Information Technology Act, 2000 (IT Act) was enacted to provide a legal framework for electronic commerce and to give legal recognition to electronic records and digital signatures.⁶¹ Its application to AI systems in securities markets is relevant across several dimensions.

Section 43 of the IT Act provides civil liability for unauthorised access to computer systems, damage to data, and disruption of computer systems. In the context of AI-driven trading, Section 43 could be invoked where a cyber-attack on an algorithmic trading system result in the generation of erroneous orders that cause market disruption. The increasing prevalence of AI-powered cyber-attacks on financial market infrastructure makes the intersection of the IT Act and securities law practically significant.⁶²

Section 66 of the IT Act creates criminal liability for offences involving computer systems, including unauthorised access and data theft. The theft of proprietary algorithmic trading code or training data by a competitor or employee could

⁶⁰ *Maneka Gandhi v. Union of India* AIR 1978 SC 597.

⁶¹ Preamble, Information Technology Act, 2000.

⁶² Section 43, Information Technology Act, 2000.

constitute an offence under Section 66 of the IT Act as well as a potential trigger for market manipulation liability under the PFUTP Regulations, if the stolen code is used to replicate or front-run the victim's trading strategy.

Section 72 of the IT Act protects confidentiality of electronic records and could be invoked by algorithmic trading firms to resist SEBI's demands for disclosure of proprietary trading algorithms in enforcement proceedings. The tension between SEBI's investigative powers under Section 11C of the SEBI Act and the confidentiality rights under Section 72 of the IT Act is an unresolved issue of regulatory law.⁶³

The IT Act does not contain any provisions specifically addressing AI, autonomous systems, or liability for algorithmic decision-making. However, the Digital Personal Data Protection Act, 2023 introduces a parallel framework governing the processing of personal data by automated systems. Under Section 6 of the Act, AI-driven platforms such as robo-advisors are required to obtain informed consent from data principals before processing investor data, while Section 8 imposes obligations on data fiduciaries to ensure accuracy, security, and lawful processing of such data. Further, Sections 12 to 14 confer rights upon data principals, including the right to access information, seek correction, and grievance redressal, which are directly relevant to investors interacting with AI-based advisory systems. These obligations intersect with securities regulation in multiple ways. The use of alternative data by AI systems raises questions as to whether such data, if derived from personal information without proper consent, would violate the DPDPA while also potentially constituting material non-public information under the PIT Regulations. Additionally, the tension between SEBI's investigative powers and claims of algorithmic confidentiality under Section 72 of the IT Act must now be reconciled with the transparency and accountability requirements imposed by the DPDPA. India has not enacted any comprehensive AI-specific legislation, and the NITI Aayog's Principles for Responsible AI (2021) remain a non-binding policy document. This evolving data protection framework highlights the need for regulatory harmonisation in addressing AI-driven activities in securities

⁶³ Section 72, Information Technology Act, 2000; Section 11C, SEBI Act, 1992.

markets, in contrast to the European Union's AI Act (2024), which adopts a structured risk-based approach.⁶⁴

XVII. SUGGESTIONS AND RECOMMENDATIONS

In light of the identified structural gaps, the paper advances the following recommendations:

1. SEBI should introduce clear statutory or regulatory definitions of algorithmic trading, high-frequency trading, and AI-driven trading systems, either through amendments to the SEBI Act, 1992 or through delegated legislation, to reduce classification ambiguity and enhance regulatory certainty.
2. The existing intent-based liability framework under Section 12A of the SEBI Act and the PFUTP Regulations should be supplemented by a calibrated model of strict or vicarious liability for entities deploying AI systems, ensuring accountability where autonomous systems generate manipulative outcomes.
3. SEBI should consider incorporating transparency obligations for AI systems, including a limited right to explanation in enforcement contexts, drawing on comparative models such as Article 22 of the General Data Protection Regulation, to ensure procedural fairness.
4. Regulatory guidance should be issued to clarify the constitutional limits of AI-related restrictions, particularly with respect to proportionality under Article 19(1)(g) and due process requirements under Article 21.
5. SEBI may develop specialised technical audit and certification frameworks for AI-based trading and surveillance systems to address systemic risk and enhance regulatory oversight.

XVIII. CONCLUSION

This paper has established the conceptual and legal foundations of Artificial intelligence in the securities market. Three structural gaps emerge from the analysis:

⁶⁴ Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act).

1. There is no statutory definition of algorithmic trading, high-frequency trading, or AI systems in Indian securities law, creating classification uncertainty that undermines regulatory certainty.
2. The mental element requirements of the principal prohibition provisions- Section 12A of the SEBI Act and the PFUTP Regulations are not well-adapted to the attribution of intent in the context of autonomous AI systems.
3. The constitutional dimensions of AI regulation in securities markets- the proportionality of regulatory restrictions under Article 19(1)(g), the due process implications of AI-based surveillance under Article 21, and the equality concerns arising from structural information asymmetries under Article 14 have not been addressed in legislation or adjudicated by Indian courts.

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