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Forecasting Market Volatility via Social Media Sentiment: A Systematic Review of Machine Learning Approaches

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Abstract

Social networks now function as primary conduits for real-time financial data, yet the mechanisms by which they induce stock market volatility remain complex and often non-linear. This study interrogates the current state of predictive modeling by systematically reviewing literature that bridges sentiment analysis with financial econometrics. Unlike previous surveys restricted to dominant platforms like Twitter, this research broadens the scope to include diverse digital channels and high-variance periods, such as the global COVID-19 crisis. Evaluating methodologies retrieved via comprehensive keyword indexing across major academic databases reveals that hybrid models—pairing Naïve Bayes or Tree-based algorithms (XGBoost, Random Forest) with sentiment lexicons and GARCH variants—offer superior predictive accuracy for near-term horizons. Despite these successes, we identify a persistent methodological flaw in extant studies: a tendency toward short observation windows and single-source data dependency. Consequently, we propose a research agenda prioritizing the development of cross-platform, longitudinally robust models capable of capturing the nuanced, non-linear dependencies inherent in modern market dynamics.

Keywords
Social Media, Stock Market Volatility, Machine Learning, Sentiment Analysis.

1. Introduction
Social media's introduction has transformed many facets of contemporary society, including the financial markets. Due to the complex interactions between technology, information distribution, and market dynamics, we have decided to investigate the "Impact of Social Media on Stock Market Volatility." and offering a unique perspective on how social media affects financial stability.

Understanding how social media affects stock market volatility is crucial for several reasons. Firstly, social media platforms act as instantaneous information centers where rumors, news, and public opinion can travel quickly, impacting market patterns and investor behavior. This phenomenon presents both opportunities and challenges in forecasting and controlling market volatility. Secondly, integrating social media analytics into financial models can enhance the accuracy of market forecasts, aiding in risk management and decision-making.

This review examines the mechanisms by which social media influences stock market volatility, aiming to provide a comprehensive summary of the current state of the field, highlight important developments, and recommend potential directions for further research.

1.1 Social Media

Social media is a topic that can be defined differently, in different aspects. Initially, different social media platforms such as: Facebook, Instagram, Reddit, Snapchat etc. would be the first ones to be considered as ideal social media platforms. But it's a bit cumbersome to critically pinpoint on the exact definition of a social media platform. In short, while we understand what social media are, we are not always able to define why they are what they are, and different disciplines approach social media differently(Carr and Hayes 2015). It may be applied to get better results, and the characteristics and applications are quite diverse. There are many different uses for it, such as interpersonal relationships, advertising, and even low- to high-level promotions. Beyond its primary functions, social media is used for both commercial and political reasons. They are also used for social, educational, and educational goals by non-governmental organizations, small companies, and uniform influences(REJMAN and PORADA 2022). Social media can be used to synthesize all the good things about the internet, into a single internet platform. As internet has become very accessible, the social media platforms are being used now, more than ever, and its versatile aspects are being explored on a daily basis. Additionally, as it's an interactive platform, its proper use can lead to many eventful results. Its interactivity is one of the main key factors and which resulted in social media platforms which are different than the generic ones such as: Ask.fm, which is a social media platform where anonymous texts can be sent; Pinterest, where pictures and inspirations of desirable categories can be found etc. In a sense, social media platform can be defined as-

Digital platforms that enable users to select and strategically engage with broad and targeted audiences, either intermittently or instantaneously, are referred to as social media. Users find value in user-generated content and in their interactions with other users (Carr and Hayes 2015).

Social media's versatility can be described in different aspects, as in some cases its uses also differ. Thus, it leads so some social media platforms having more users than others. It can be portrayed in **Figure 1**

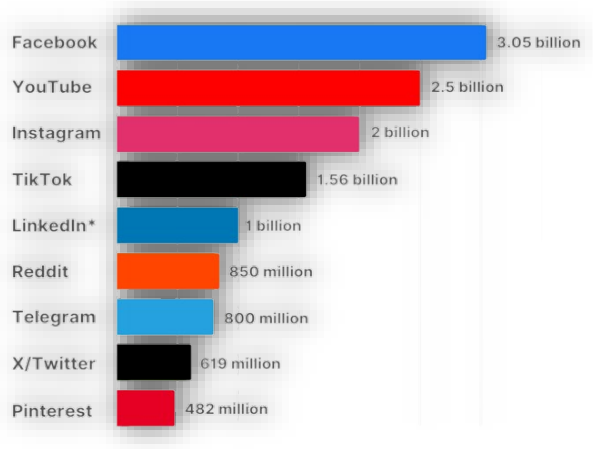


Figure 1. Monthly active users of Social Media platforms worldwide 2024

1.2 Effects of social media

Social media dissolves all the boundaries between the impacts it creates in our society and many fields. Most appreciating fields in which social media has its considerable effects include business, marketing, education, politics, governance, technology, innovation, and, most importantly, on human sentiments.

Business and Marketing

In business and marketing social media can play a crucial role by enhancing communication and collaboration in business by connecting with customers, employees, and stakeholders. Social media also provides valuable insights into customer behavior, aiding in the customization of marketing strategies and products to meet consumer needs (Okonkwo and Awad 2023). On the other hand, Studies have shown that factors like negative comments or opinions, fake news, and controversial brand posts through social media can have adverse negative impacts on brand image for businesses (Oriakhi, Amin, and Safdar 2023).

Education
Social media platforms facilitate easy information exchange, engaging learning, enhanced social skills, multicultural exposure and global trend awareness providing a positive impact on education. However, distractions due to social media and potential misinformation from social media is also have a negative impact (Tuhuteru et al. 2023).
Politics and Governance
social media enables direct communication between politicians and citizens, fostering political engagement through feedback mechanisms like comments and political slogans. Utilizing social media for election campaigning and political communication is becoming more and more common (Jermsittiparsert et al., n.d.). Social media influences voting, protests, government attitude, and politicians' actions.

Technology and Innovation
Social media impact on technology and innovation—from participation in order to innovate in dissemination among users and paving ways for consumers to communicate—presents itself through numerous case studies online or those promoted by the social media pitch camps and many other competitions. Social media enhance technology and innovation because it advocates for research, industry, and community communications through collaboration where decisions are made under dynamic environments that promote creativity and discovery of knowledge.(Alhajj 2018).

Human Sentiment
Social media plays a significant role in shaping human sentiment or opinion, as evidenced by various studies such as social media can have influence on opinion dynamics, potentially leading to a convergence of opinions towards a single dominant viewpoint, resembling a dictatorship, under certain conditions (Nazeri 2018). Social media users can be easily influenced by negative content or toxic individuals, leading to emotional responses and unnecessary opinions. Also, the constant exposure to social media can affect individuals' mental well-being, causing feelings of stress, anxiety, and even depression due to the pressure of immediate responses and interactions. Despite these negative effects, social media can also provide a sense of connection, community, and support for individuals, allowing them to engage with others and share experiences and content in a more accessible and immediate manner.

1.3 Stock market

A stock market is a trading platform for publicly traded companies' stocks(equity) and other financial instruments, where the price of shares is often referred as "share" or "stock price" (Wanjawa and Muchemi 2014). It has vast resource but really complex for the new comer. It is among the financial market's most influential ingredients. Here, buyers and sellers collaborate to complete collaborations. (Coyne, Madiraju, and Coelho 2017). The price of stock market changes based on the investors who want to buy and the investors who wants to sell the existing stocks. Also, it serves as a measure of the economy's health and a key indicator of the world's economic strength. Understanding the state of the market is typically challenging. Since stock values are dynamic, non-parametric, and non-linear, they frequently contribute to statistical models' poor performance and give a failure to anticipate precise values and movements (Naeini, Taremian, and Hashemi 2010). The efficient market hypothesis (EMH) states that financial market movements depend on news, current events and product releases (Pagolu et al. 2017).

The New York Stock market (NYSE), located at 11 Wall Street in New York City, is the most prestigious stock market in the United States and ranks first on the list of all stock exchanges in the world. NASDAQ, a stage and acronym for the National Association of Securities Dealers Automated Quotations, is ranked second among the world's largest stock exchanges. It's a stock exchange in America. It includes the world's largest tech companies, including Apple, Microsoft, Google, Facebook, Amazon, Tesla, and Intel, and has more than 3,000 stocks listed under it. Situated in Shanghai, China, the Shanghai Stock Exchange (SSE) is the largest stock exchange in Asia and the third largest in the world.

According to The Daily Star, accessed 11 October 2022, the Bangladesh Securities and Exchange Commission or briefly the BSEC is the regulatory body for the capital market of Bangladesh, comprising Dhaka Stock Exchange (DSE) and Chittagong Stock Exchange (CSE). The main stock exchange of Bangladesh is DSE.

Figure 2. World largest stock exchanges in Trillion Dollar

Because financial markets are inherently complicated and impacted by a wide range of factors, such as political developments, investor emotion, and economic data, forecasting the stock market can be difficult. (Adedoyin Tolulope Oyewole et al. 2024). The efficient market hypothesis states that stock prices shouldn't be predictable with more than 50% accuracy; instead, they should follow a random walk pattern. (Qian and Rasheed 2007). Larger broker companies typically use stock analysts to analyze market patterns and forecast the profits or losses. These analysts have broad and superior information collecting abilities that they have developed over the course of their careers. (Piotroski and Roulstone 2004). There are two main primary categories for which stock market can change: fundamental and technical. A company's earnings, operational profitability, and the products or services it provides are its fundamental components. On the other hand, technical factors are sentiment and statistical analyses of stock price trends (Figure 1- Figure 7).

1.4 Stock Market Volatility

The term "stock market volatility" describes how frequently and how much prices vary in the stock market.
The market is deemed volatile when prices change dramatically and frequently. Stock market volatility, a key indicator of uncertainty and risk in the financial markets, is influenced by various factors such as historical price changes, macroeconomic indicators, and global trade dynamics(October 1990)(Bhowmik 2013). Studies have shown that stock market volatility tends to peak during recessions and times of financial crises, impacting investor behavior and economic output(Guo 2002). The analysis of over forty empirical studies reveals that stock market volatility exhibits characteristics like mean-reversion, clustering, and heteroscedasticity, with GARCH models being commonly used to model volatility persistence(Sartaj Hussain, K. V. Bhanu Murthy, and Amit Singh 2019). Furthermore, the quantification of financial volatility using econometric models helps in understanding and measuring the risk associated with investments in emerging stock markets, especially during periods of global financial crises(Index and Capital 2012). Overall, stock market volatility plays a crucial role in shaping investment decisions, market dynamics, and economic stability.

Stock market volatility is influenced by a multitude of factors, as highlighted in the research papers. These factors include macroeconomic conditions such as GDP, industrial productivity, oil price volatility, and financialization of commodities(S. Li et al. 2022). Additionally, company-specific fundamentals like earnings and dividend payments play a role in determining stock price volatility(Hewamana, Siriwardhane, and Rathnayake 2022). Behavioral factors, such as social unrest events, also impact the volatility of stock returns(S. Li et al. 2022). Additionally, market volatility is a crucial metric for evaluating market risk and choosing investments, with international investors favoring derivatives based on volatility indicators. The study on emerging markets suggests that factors like VIX, TED spread, oil prices, sentiment indices, and macroeconomic indices influence the probability of switching between different

states of volatility in markets(Czapkiewicz and Choczyńska 2021). Overall, stock market volatility is a complex phenomenon influenced by a combination of macroeconomic, company-specific, behavioral, and global factors**.**

Figure 3 shows the impact score of the factors effecting stock market volatility.

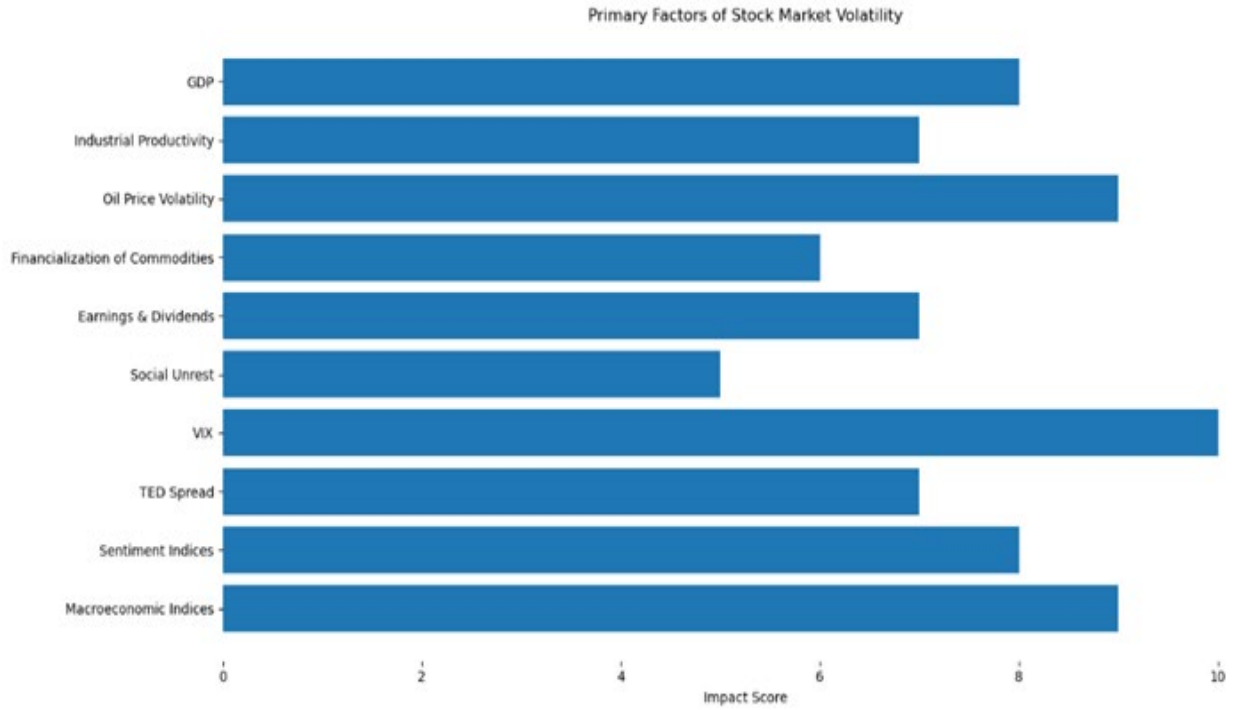


Figure 3. factors of stock market volatility

1.5 Effect of social media on stock market

Social media also extends their great influence on the dynamics of the stock market. This development has ensured that information spreads at a very unparalleled pace across all social media platforms like Reddit and Twitter. Information obtained from social media, the behavior of online communities, and perceptions of firms go hand in hand with investors in making their decisions. (Abu-Taleb and Nilsson 2021). Research indicates that social media sentiment, content, and user behavior also impact stock market returns (Liao and Huang 2023) .

Social media has a greater impact on the stock market compared to mass media, influencing volatility and percent changes significantly in the short term.(Bentolila and Thompkins 2022) The value of incorporating social media data alongside traditional financial indicators give more accurate stock price predictions and market surveillance. For example, social media plays a significant role in influencing stock market behavior, especially during events like the meme stock mania of 2021, where retail investors' discussions on platforms like Reddit had a notable impact on stock trading activities (Cruz, Kinyua, and Mutigwe 2023). The GameStop saga is another notable example of how virtual communities can challenge established market dynamics. Retail investors, grouped through WallStreetBets on Reddit, initiated a short squeeze on GME stock, leading to a significant increase in the stock price (Mancini et al. 2024). Elon Musk, Tesla's CEO, has been found to have a direct influence on market trends through his Twitter interactions. Elon Musk's tweets impacted Tesla's stock market; an increase in tweet engagement correlates with a rise in Tesla's closing price (Bhadamkar and Bhattacharya 2022).

Social media, particularly platforms like Twitter and Stock Twits, significantly impact stock market trends by providing valuable insights into user sentiment and opinions (Hao and Chen-Burger 2022). The influence of tweets on the US stock market has been investigated, revealing a two-day delay in impacting S&P 500 trends and the importance of sentiment analysis in understanding market behavior (Hao and Chen-Burger 2022). Moreover, It was discovered that the GNH of Facebook can predict the daily variation in returns and trading volume of the US stock market. In fact, an upsurge amounting to one standard deviation in the GNH of Facebook is linked with upping the

market return by 11:23 basis points in the following day. (Karabulut 2012). Social media sentiment, especially from authenticated users, positively impacts stock market returns. Non-authenticated users also influence returns moderately. Different user classifications show varying effects on the stock market (Liao and Huang 2023).

2. Literature Review

The impact of social media trends on advertising, emphasizes the need for marketers to adapt to changing consumer behavior and use targeted, personalized approaches. It suggests that traditional aggressive advertising is no longer effective, and marketers should focus on building relationships with customers and targeting specific niches. The shift towards digital and social media marketing due to consumer resistance to traditional tactics (Wright et al. 2010).

Research also found that social media marketing efforts (SMMEs) significantly positively affect brand equity, including brand awareness and image. Brand equity acts as a mediator between SMMEs and key customer outcomes like loyalty, preference, and willingness to pay a premium price. However, there is a lack of empirical research on how social media marketing activities influence brand equity creation and consumer behavior. Entertainment, interaction, trendiness, word-of-mouth, and customization contribute to building brand equity, and that social media can compete with traditional marketing channels. The study suggests a multinational approach is feasible.(Godey et al. 2016) .

Several studies have been done to understand the effect of social media on stock returns through sentiment analysis. Study used sentiment analysis where tweets were analyzed and labeled them for sentiment using Linear Regression, Naïve Bayes, and Smart User Classification. An average accuracy of 0.643 in predicting the direction of stock prices described that social media sentiment can be a helpful predictor of changes in stock prices provided it is filtered to include "smart users" who make precise predictions (Coyne, Madiraju, and Coelho 2017).

Sentiment analysis and the social influence model analyze investor sentiment and the diffusion of mood in the stock market based on behavioral finance theory. One paper has attempted to integrate GARCH and VAR regression to find the correlation between Tencent's moods and the Hushen-300 stock index. It can, therefore, be concluded that SI-based Tencent finance-related moods can interpret stock market fluctuation due to investors' irrational behaviors (D. Li et al. 2019).

More recent studies have focused on developing methods for extracting sentiment from social media, such as natural language processing, machine learning, and deep learning (Nyakurukwa and Seetharam 2023). By using machine learning algorithms, it has been found that social media and financial news data have an impact on stock market prediction accuracy for ten subsequent days. The highest prediction accuracy of 80.53% was achieved using social media data, and 75.16% using financial news data (Khan et al. 2022). Research also found that the RHT stock was the least affected by spam tweets, while the LSE stock market was the most influenced by spam tweets on social media (Khan et al. 2022). Thus, we can say that not every stock will equally be effect through social media.

It is complex to predict stock market for smaller firms as there are lack of data. Using firm-specific Twitter sentiment, it is discovered that there exists a relationship between Twitter activity and trading volume, with more tweets on a stock indicating bigger stock returns (Duz Tan and Tas 2021). Twitter sentiment is more suited for short-term investing due of its weak forecasting capabilities. Studies also had highlighted how crucial social media is for spreading business information and influencing investor behavior (Duz Tan and Tas 2021).

A paper considered the user-centric analysis associated with stock market predictions using social media and demonstrated that content was more predictive in nature than the user's self-labeled sentiment. Predicting the stock market movement using social media information is possible, although it does so more precisely in the shorter term than it does in the longer ones. (Bouadjenek, Sanner, and Wu 2023).

But there is no apparent correlation between stock prices and non-financial mood on Twitter, according to two research (Canadian and Sector 2024). But in the case of TC Energy and Enbridge, stock prices might be predicted by Twitter sentiment during periods of heavy activity. in order to comprehend the influence of digital discourse on stock prices, cross-sectoral comparisons and a focus on certain events that significantly alter sentiment scores are necessary (Canadian and Sector 2024).

Social media sentiment in the stock market is examined over the past decades, dominated by the fields of mathematical sciences and computer sciences where China, the USA, the UK, and other European countries leads in these studies (Nyakurukwa and Seetharam 2023). In China a paper published which examines the influence of social media data on stock volatility using data from various Chinese financial platforms. The findings indicate that social data, such as stock attention and discussion, have a more significant impact on volatility than public sentiment. The prediction model incorporating social data can forecast stock volatility with over 60% accuracy, though the influence of social data declines over time. Limitations include the short data collection period, reliance on a single platform, and limited social attributes (WU et al. 2017).

Another study based on social media rumors on the stock market, investigates the impact of social media data on stock market volatility in the Chinese context. Leveraging a comprehensive dataset from various financial platforms, the authors find that social data, such as stock attention and discussion, exert a more significant influence on volatility than public sentiment. The prediction model incorporating social data demonstrates an ability to forecast stock volatility with over 60% accuracy, although the impact of social data tends to diminish over time (Zhang et al. 2022).

2.1 Literature review

The literature review is presented in Table 1.

Table 1. Literature review

Reference	Year	Data source	Number of data set used	Classification or methods	Results
(Nabipour et al. 2020)	2020	Four stock market groups (financials, petroleum, non-metallic minerals and basic metals) from Tehran stock exchange	Ten years of historical data from November 2009 to November 2019	Nine machine learning models (Deci-Sion Tree, Random Forest, Adaboost, XGBoost, SVC, Naïve Bayes, KNN, Logistic Regression and ANN) and two deep learning methods (RNN and LSTM.	This wasn't improved much until using binary features instead of continuous features. Indeed, it was deep learning algorithms, like RNN and LSTM, which became our top two models in both approaches.
(Chahine and Malhotra 2018)	2018	Twitter platform for 312 firms from the Fortune 500 firms.	Final sample includes 312 firms	Event history analysis (EHA)	The study reveals that while investor reactions to Twitter platform launching are generally positive, firms with positive market momentum benefit more from social networking sites, particularly those with family or dominant shareholders.
(Awan et al. 2021)	2021	Two types of sources 1.The historical datasets of companies 2.Yahoo! finance and Kaggle.com	Historical datasets of 10 companies in the last 15 years.	Linear Regression Algorithms, Decision Tree Algorithms, Generalized Linear Regression, Random Forest, Naive Bayes, Logistic Regression.	More realistic results were returned by linear regression, random forest, and generalized linear regression, unlike the decision tree model. When Naive Bayes and Logistic Regression were applied over data texture, it gave an accuracy ratio of about 77% to 80%.
(Nyakurukwa and Seetharam 2023)	2023	Scopus as primary database and Web of Science(WoS) as secondary database	366 documents comprised of conference proceedings as well as peer-reviewed articles.	Bibliometric analysis	Stock market sentimental analysis research based on social media is so mathematical and computer-based; thus, China, despite censorship, stands at the forefront in such research, going down to natural language processing, machine learning, and deep learning techniques.
(Dewangan, Siddiqui, and Trehan 2022)	2022	Scopus, Elsevier, Science Direct, SAGE, Emerald, Taylor and Francis and Google Scholar	50 articles	Systematic literature review	Social media influencers' impact on children and adolescents, who are highly exposed to screens, reveals vulnerability in influencer marketing and significant impact on children's food and tourism industries. Studies on social media influencers are predominantly conducted in the USA, Europe, and Asia, with China being the most studied region.

(Khan et al. 2022)	2020	Twitter for source of social media data, Yahoo Finance for historical price data, Business Insider for financial news.	70% training data (350 samples) and 30% testing data (150 samples)	Final datasets are standardized using a **StandardScalar class of Scikit-learn**. **SelectKBest (Chi2),** **PCA** applied to reduce redundant features/components in a dataset. **Hybrid Algorithm** 12 machine learning classifiers are These are GBM, ET, CART, RF, LDA, KNN, MLP, SVM, LR, GNB, MNB, and AB.	This study again proved that feature selection and reduction of spam tweets improve the performance of classifiers, while recommending RF for predicting the stock trends. Social media platforms were found to influence the volatility stocks like NYSE, IBM, and TWTR, while news influences LSE and MSFT stocks.
(Kumbure et al. 2022)	2022	Used four databases, ''Scopus'', ''IEEE Xplore'', ''Web of Science'', and ''Science Direct''	Examined 138 journal articles published between 2000 and 2019 and used 2173 unique variables	A systematic literature review methodology, automated search techniques, and commonly used techniques like artificial neural networks, support vector machines, and Bayesian networks.	The other attention-receiving markets were the S&P 500 index, followed by Taiwan, China, and South Korea. Some popularly used machine learning-based prediction models are ANN, SVM, and fuzzy theory, and quite recently some deep learning techniques. General feature extraction methods used are PCA and wavelet transform
(Bouadjenek, Sanner, and Wu 2023)	2023	Tweets data with 5 complete years of posted messages, ranging from 2015 to 2019. The StockTwits Data reflect the same 5-year period of messages posted. Used Stock Market Data provided by Yahoo! Finance..	Large-scale analysis of data for 1,000 stocks. For twitter data a total a	VADER sentiment, (to provide sentiment features for posts) mainly used the Logistic Regression (LR)	So, the self-supervised sentiments, emojis, words, and text-based features will allow the machine learning classifier to predict beyond 20 days. StockTwits outperformed Twitter data and social media for stock market prediction yields higher accuracy for short-term forecast compared to a long-term forecast.
(Alves, Fernandes, and Raposo 2016)	2016	Web of science	Initial search was 108 articles, excluded 63 articles and maintained 44.	Systematic review	The results emphasize the impact of social media on brand loyalty, consumer behavior, and the need for diverse and optimized social media strategies.
(Soni, Tewari, and Krishnan 2022)	2021	Different data sources including Yahoo and NSE-India.	25 articles	systematic review of machine learning approaches	Though the graph-based GCN approach captures causation and produces the best overall results, for large datasets, the RF algorithm produced the most satisfying results; for small sets, the highest accuracy was given by Naive Bayesian while Partial Least Squares gave the least error.
(Gurung et al. 2024)	2024	Pandas' library for manipulating and analyzing data. Python programming language; Scikit-learn library pre-injected for all machine-learning algorithms and analytic metrics. LIME A library for Explainable AI was used.	Amazon Stock Exchange, spanning from October 19, 2018, to October 16, 2022	Ridge Regression, Ada-Boost, Light-GBM, XG-Boost, Linear Regression, and Cat-Boost	XG-Boost attained the highest R-squared (99.24%) and accuracy (99.23%) among all the algorithms. The linear regression came second, where it achieved R-squared (98.02%) and accuracy (98.04%)
(Rouf et al. 2021)	2021	various search engines, digital libraries and databases,	mainly focused on the studies from last decade (2011–2021)	Artificial Neural Networks (ANN), Support Vector Machine (SVM, Naïve Bayes (NB), Fuzzy Logic	Techniques such as Artificial Neural Networks (ANN) and Deep Neural Networks (DNN) are commonly used because they offer more accurate and faster

		including 'google scholar', 'research gate', 'ACM digital library', 'IEEE Explore', 'Scopus' and so on.		(FL), Hybrid Algorithms (HA), Genetic Algorithms (GA), Regression Algorithms (RA), Ensemble Algorithms (EA).	predictions. By combining market data with textual data from web sources and applying effective feature extraction and selection algorithms, the accuracy of stock market predictions can be significantly improved
(Basak et al. 2019)	2018	Stocks of ten companies like Nike, Toyota, Facebook, Amazon, Apple, etc.	all of the data available have been used, i.e., starting from the day they went public till 3rd February 2017	Random forest (RF), Gradient boosted decision trees (XGBoost)	Both gradient boosted decision trees (XGBoost) and random forests (RF) are capable of making accurate stock price predictions; the accuracy of these models increases when the prediction window is extended from 3 days to 90 days.
(Ampomah et al. 2021)	2021	Three different stock market (NYSE, NASDAQ and NSE) through yahoo financial application programming interface (API)	8(AAPL, ABT, KMX, S&P_500, TATASTEEL, HPCL, BAC)	(i) GNB model, (ii) (GNB_Z-Score) (iii) (GNB_Min-Max) (iv) (GNB_PCA) (v) (GNB_FA) (vi) (GNB_LDA) (vii) (GNB_Z-Score_PCA) (viii) (GNB_Z Score_FA)(ix)(GNB_Min-Max_PCA) (x) (GNB_Min-Max_FA)	Gaussian Naive Bayes (GNB) performs better when combined with feature extraction and scaling techniques, with the GNB_LDA model outperforming other models in specificity and standardized scaling. on the specificity metric, the GNB model with Min-Max scaling and PCA was the best
(Asghar et al. 2019)	2019	**Analytical approaches** involve utilizing various financial sources such as Yahoo Finance, Google Finance, and the Pakistan Stock Exchange. On the other hand, **sentiment-based approaches** focus on analyzing user-generated reviews about specific stocks, which are posted on various online forums and review sites	Didn't mentioned	stock prediction by applying A multiple regression model using R software	The mentioned multiple regression model achieved prediction accuracies of 95% on the KSE 100-index dataset, 89% on the Lucky Cement dataset, and 97% on the Engro Fertilizer Limited dataset
(Nti, Adekoya, and Weyori 2020)	2019	social media (54%), financial web-news (29%), search engine queries (7%), and macroeconomic variables (7%)	one hundred and twenty-two (122) pertinent research works reported in academic journals over 11 years (2007–2018) in the area of stock market prediction using machine learning.	**Technical analysis** encompasses various methods such as the Simple Moving Average (SMA), Exponential Moving Average (EMA), Moving Average Convergence/Divergence (MACD) rules, Relative Strength Index (RSI), and On-Balance Volume (OBV). These techniques are used to analyze market trends and price movements. **Fundamental analysis** focuses on evaluating a company's financial health and performance through metrics like Return on Equity (ROE), Market Capitalization (MC), Price/Sales Ratio (P/S), Price/Book Ratio (P/B), Price/Earnings Ratio (P/E), and Return on Assets (ROA). These indicators help	Research indicates that 66% of stock market prediction studies rely on technical analysis, while 23% utilize fundamental analysis, and 11% employ a combination of both methods. Among the machine learning techniques, Artificial Neural Networks (ANN) and Support Vector Machines (SVM) are the most widely used. Notably, ANN has demonstrated superior performance compared to SVM and Decision Tree (DT) models, primarily due to its lower error metrics.

				investors assess the intrinsic value of a stock.	
(Coyne, Madiraju, and Coelho 2017)	2017	StockTwits	1,013,794 twits	Linear Regression, Sentiment Prediction (Naïve Bayes model), Smart User Classification	The average accuracy came out to 52.45% (Linear Regression) "Smart users" on social media who make accurate stock price predictions, can predict stock price movements with 64.3% accuracy on average.
(Duz Tan and Tas 2021)	2020	Twitter and StockTwits	1,063 stocks between the sample period of 2015 to 2017 with the inter-national investor perspective	Bloomberg uses the raw message feeds from both StockTwits and Twitter as inputs and apply a proprietary natural language processing algorithm to classify each tweet	Twitter activity and sentiment are associated with trading volume and returns, and predict subsequent-day trading volume daily firm-specific
(Bhandare et al. 2020)	2020	dataset was created by scraping the data primarily from marketsmojo.com Downloaded as CSV files from SAMCO and stored in a MySQL database (The National Stock Exchange of India Ltd)	stock prices from 2016 to 2019	Naive Bayes classifier, specifically a Gaussian Bayes Classifier.	1. Accuracy for 2017 ratings 81.96 % 2. Accuracy for 2018 ratings 86.12 % 3. Accuracy for cumulative data for 2016-18 is 91.89 %
(Agarwal, Kumar, and Goel 2019)	2019	Reviewed 106 papers from 1992-2017	does not used a specific dataset	Systematic literature rivew	The review reveals a dearth of studies on how internet information affects stock markets in emerging countries and the behavior of retail investors.
(Agarwal, Kumar, and Goel 2021)	2021	Twitter data and stock market data collected over a period of 15 months (from 1st August 2017 to 10th November 2018) as its data sources	Tweets regarding the companies included in the 11 sectorial indices of the Indian economy, or the Nifty50.	VADER sentiment analysis tool, Granger-casualty tests, Finance-related Lexicon, Naive Bayes Classifier	Information spreading through Twitter has a small but significant correlation with stock market performance in developing nations, especially with those sectors related to Banking and Financial Services. On the other hand, this is not manifested in other economic sectors or overall market indices.
(Mai et al. 2018)	2018	Bitcointalk.org, Twitter, Web traffic data for Bitcoin.org from the Alexa Web Information Service and News sentiment scores from the Thomson Reuters News Analytics (TRNA) database for news articles containing the word "bitcoin".	1) Posts from the Bitcointalk.org forum, from January 1, 2012, through December 31, 2014, comprised of 343,769 posts and 15,420 topics; 2) Tweets from Twitter's API that contained the #Bitcoin hashtag, from September 16, 2014, through December 16, 2014, totaling 3,348,965 unique tweets from 339,295 unique users;	Sentimental analysis and vector error correction models (VECM) to examine this dynamic interaction	Results indicated that the sentiment in social media is one of the major drivers of the value of bitcoin, and usually, positive posts in forums increase the value of bitcoin in the future. The so-called "silent majority" of the inactive users contributed less than 40% of the messages, which is more than the vocal minority. Forums have a greater influence than Twitter in setting prices for bitcoin.
(Rhoda Adura Adeley	2024	Comparative analysis of the review of multiple source	Not mentioned	comparative analysis of model performance metrics, including Mean Absolute Error (MAE), Mean Squared	This work, therefore, tries to explore improved stock market prediction using different machine learning approaches, such as LSTM, GRU, SVMs, logistic

e et al. 2024)				Error (MSE), and accuracy rates	regression, hidden Markov models, ensemble methods including Random Forests, and Gradient Boosting.
(WU et al. 2017)	2017	Social media data from Xueqiu.com in China, Sina Finance and Economics, Sina Microblog, and Oriental Fortune	The dataset includes stock price data, stock rankings, stock portfolio data, and public opinion data Which accumulated to in total 186995 records.	Structured handling of non-text data, Sentiment analysis of text data	Although the prediction model may correctly estimate stock volatility over a period of three days, the social data, which is represented through attention and discussions over time, bears a larger impact on volatility and does not signal anomalous events.
(Karabulut 2012)	2023	Thomson Reuters DataStream provides Facebook data for the US.	The observation period runs from April 27, 2012, to January 1, 2008.	Examined, with the use of VAR models, whether GNH was related to stock market returns over longer horizons-extended up to 3 weeks-using weekly data, controlling for macroeconomic conditions to see whether GNH was proxying for investor sentiment..	The Facebook-based Gross National Happiness (GNH) measure can predict significant changes in stock market returns and trading volume, but this effect is temporary and reverses in weeks, aligning with noise trader models. It also robustly predicts increases in future trading volume..
(Ranco et al. 2015)	2015	Twitter, DJIA index	The Dow Jones Industrial Average (DJIA) index comprises 30 stocks, and its sentiment on Twitter and financial time series data are accessible at http://dx.doi.org/10.6084/m9.figshare.1533283.	- Sentiment classification of tweets using supervised machine learning - Correlation and Granger causality analysis between Twitter sentiment and stock price returns - Event study methodology to detect Twitter volume peaks as "events", categorize them by sentiment, and analyze the cumulative abnormal returns around the events	This relationship applies to known events like earnings announcements and other detected Twitter activity. A recent independent study further categorized non-earnings announcement events.
(Garg and Tiwari 2021)	2021	Research papers	1,450 documents from the Scopus database from 2010 to 2020	Used VOSviewer software to generate co-authorship analysis network maps and keyword occurrence networks	Key findings of the study include a bibliometric analysis of research about stock market prediction using social media sentiment. It also describes major journals and authors, cited papers, countries and institutions, and keyword occurrences in this area of research.
(D. Kaya, Maramraju, and Nallapu 2023)	2023	Data collection from Reddit, news outlets, and financial websites.	A dataset of 1,199 social media events ranging from January 2022 to July 2023, related to 6 mega-cap technology stocks, were then labeled as positive-891 events-or negative-308 events-based on the displays of attention towards the respective firms.	Discontinuous Model of Regression using "Socialmedia" dummy variable: 1 for positive, 0 for negative events. Trading volume and stock price as control variables Regressions run for the overall group of 6 stocks and individually for each stock	We have examined six leading technology stocks and noticed that good happenings of social media are low volatility, and high-volume trading with rising stock prices lead to heightened volatility. The results on Alphabet, Tesla, Meta, and Microsoft are mixed. Our volatility of Alphabet and Tesla decreased while that of Meta and Microsoft increased, which could be due to the excess demand from short-term players in both. However, Apple and Nvidia do not show any important relationship between social media happenings and volatility.
(D. Li et al. 2019)	2018	Tencent Weibo	It includes 10,000 samples, in which around 1.5	Sentiment analysis, incorporating GARCH with VAR regression.	The paper focuses on how social media data, sentiment analysis, and social influence modeling are critical means to

			million users contributed 13 million financial weibos. In addition, a small testing data set containing 11,000 target users and their weibos is prepared for the social influence analysis.		understand investor perceptions and their subsequent consequences for financial markets. It also brings to light the relevance of new data sources, such as Tencent Weibo, for better comprehension of stock market behavior and fluctuations.
(Wright et al. 2010)	2010	Different online ad methods and social media platforms; thus, it doesn't have a specific data source	Examines how social media trends—such as mobile marketing and social media opportunities—have affected advertising and the tendency toward closer-knit client relationships.	Not applicable (the paper is a review and discussion, not a report of an empirical or numerical study)	It represents an important mission of marketing and social communication to keep open lines with consumers for creating real values for their customers. Considering the marketing strategies in relation to the audience has been the most efficient choice thus far.
(S et al. 2020)	2020	The main source of data was an experiment in which participants were randomized at random to conditions pertaining to media interactivity, message vividness, and anthropomorphism, and their responses were recorded.	240	The study used a 2 x 2 between-subjects experimental design, focus group interviews, pre-tests, and advertising agency to identify social media platforms, product categories, and brands, validate perceived interactivity and brand familiarity.	By forming a conclusion, it contributes significantly to the literature on social media advertising and marketing communication in several ways: 1. The causal effect of social media interactivity on advertising effectiveness; 2) Emphasizing the negative implications associated with media interactivity and strategies for mitigating these effects, 3. It enlightens one on the underlying psychological process of the flow experience.
(Godey et al. 2016)	2016	A survey of followers of the five luxury brands under investigation on social media in China, France, India, and Italy	845	Analyzing luxury brands in the luxury sector, surveying luxury brand consumers, designing a quantitative survey, translating the questionnaire into the respondents' mother tongue, and validating the measurement scale structures.	1. All five dimensions of social media marketing effort entanglement-entertainment, interaction, trendiness, WOM, and customization-contribute to brand equity. 2) Social media marketing can be used as an effective tool for building brand image and emotional connections with brands. 3. Social media marketing efforts have an indirect effect through their impact on brand equity. 4) Social media marketing results are relatively similar across mature and new luxury markets, which again could suggest that a multinational approach is workable.
(Evangelos Vasileiou 2022)	2021	Eikon database	Not mentioned (the paper does not explicitly state the number of data points in the dataset)	1. Uses intraday data on the GameStop stock price from January 4, 2021 to March 26, 2021. 2. The first differences between the GME Google Search Index and trading volume were used. 3. A GARCH (1,1) model was employed	Trading volume and Google searches can provide useful information in explaining the GameStop short squeeze; that information speed does indeed matter, with the contemporaneous Google search data having a positive impact on GME prices, while a 1-hour lagged Google search negatively affects it.
(Jiao, Veiga, and	2020	The Thomson Reuters MarketPsych Index (TRMI) database is	Not mentioned (the paper does not explicitly state the number	Thomson Reuters MarketPsych Index (TRMI) database	On one hand, high social media coverage predicts high subsequent return volatility and trading activity. On the other hand, high news media coverage predicts the

Walther 2020)		used to derive sentiment and buzz metrics from social media and news media.	of data points in the dataset)		opposite. These findings call for new theories to explain such different relationships between social/news media and stock prices.
(Hung 2020b)	2020	IRS Statistics of Income, Facebook Social Connectedness Index (SCI), and Compustat	Not applicable (this is not a meta-analysis)	1. Used IRS tax filing 2. Constructed a measure of "friends' participation" using the Facebook SCI. 3. Employed the revelation of financial misconducts as an exogenous negative shock to establish causal inference.	1. Social connectedness and peer effects play an important role in stock market participation decisions, with a 1 percentage point increase in friends' participation leading to a 14-25 basis point increase in local participation. 2. The increase in stock market participation among low-income households driven by peer effects is associated with lower income inequality in metropolitan counties in the following two years.
(Thakkar and Chaudhari 2021)	2021	Financial news sources like Yahoo Finance and Google Finance, Thomson Reuters tick history, stock exchanges like NASDAQ Nordic, London Stock Exchange, Shanghai Composite Index, and future market data for crude oil, natural gas, copper, and gold.	Not applicable	-Econometrics-based statistical methods, computational intelligence-based techniques, and neural network-based deep learning methods are essential tools for data analysis and prediction.	The paper assesses the application of deep neural networks for the forecasting of stock prices and trends, dealing with the effectiveness of nine various models that use different feature sets of temporal stock market data.
(Sarder Abdulla Al Shiam et al. 2024)	2024	Employs a heterogeneous dataset comprising financial, operational, and market data, procured via numerous stakeholder interviews and utilizing multiple sources to ensure precision and lucidity.	Not applicable (the paper is a single study and does not compare multiple studies)	Data collection, preprocessing, development, performance evaluation, and ethical considerations were prioritized in a deep learning model for financial analysis, ensuring informed consent and data confidentiality.	CNNs can significantly improve organizational decision-making in stock market, supply chain management, customer relationship management, and investment strategies by outperforming traditional algorithms in accuracy and insights extraction.
(Abu-Taleb and Nilsson 2021)	2021	Utilized 208 investors' questionnaire answers, which were sent to the authors' contacts and shared on Facebook under the pages "Unga aktiesparare Umeå" and "Aktiespararna Västerbotten Umeå."	Not applicable.	The study utilized a quantitative research methodology, utilizing an online self-administered questionnaire distributed via social media, emails, and service providers, and analyzed using Microsoft Excel and the ordinary least squares regression method.	The study reveals that social media, online community behavior, and firm image significantly influence investment decisions.

2.2 Reviewed literature

Our research entailed perusal of a multitude of articles on social media, the stock market, and correlation between social media and stock market dynamics. First, to establish the relevance of our study, we considered the ongoing research on the topic. We did this by categorizing the data into two streams: a) the total number of studies on social

media and the stock market, from the year 2000 to 2024; and b) the top 10 countries that conducted the research, based on demography.

By year

A total of 161010 papers were published from 2000 to 2024. This data was obtained from google scholar by searching the title social media and stock market, which showed the data of all the paper containing the keywords **(Figure 4).** And later only the paper with title Stock market was searched and we obtained only the paper that have stock market on its title **(Figure 5).** So, looking at the trend from the graph generated from the data we saw the research on our title have a positive slope, indicating the topic is being constantly researched on and has relevance with the current world.

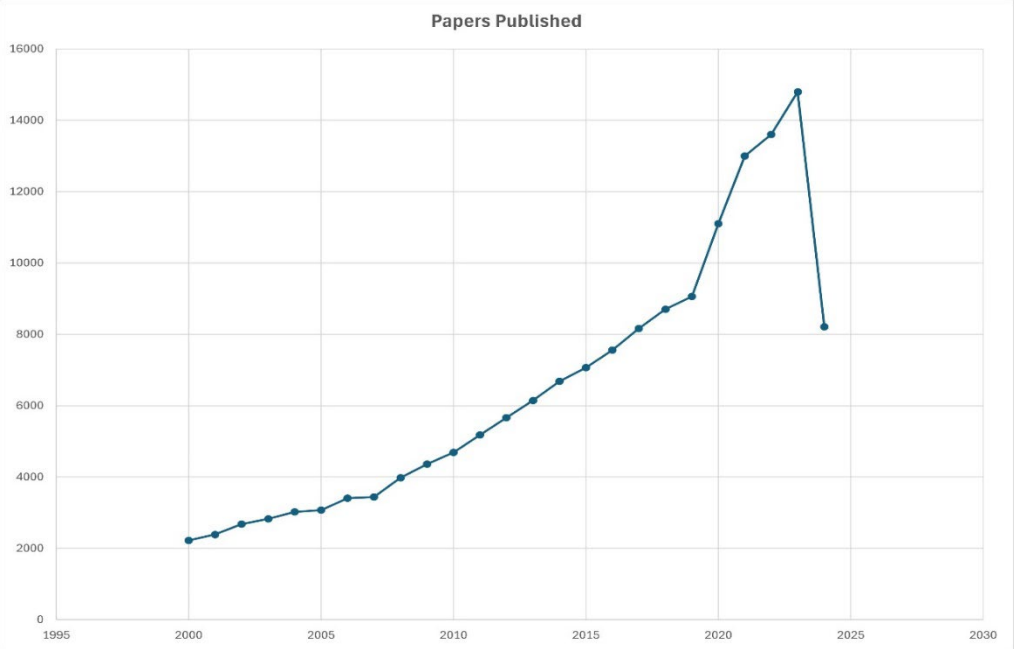


Figure 4. Total paper published on social media and stock market from 2000 to 2024 (Author's own)

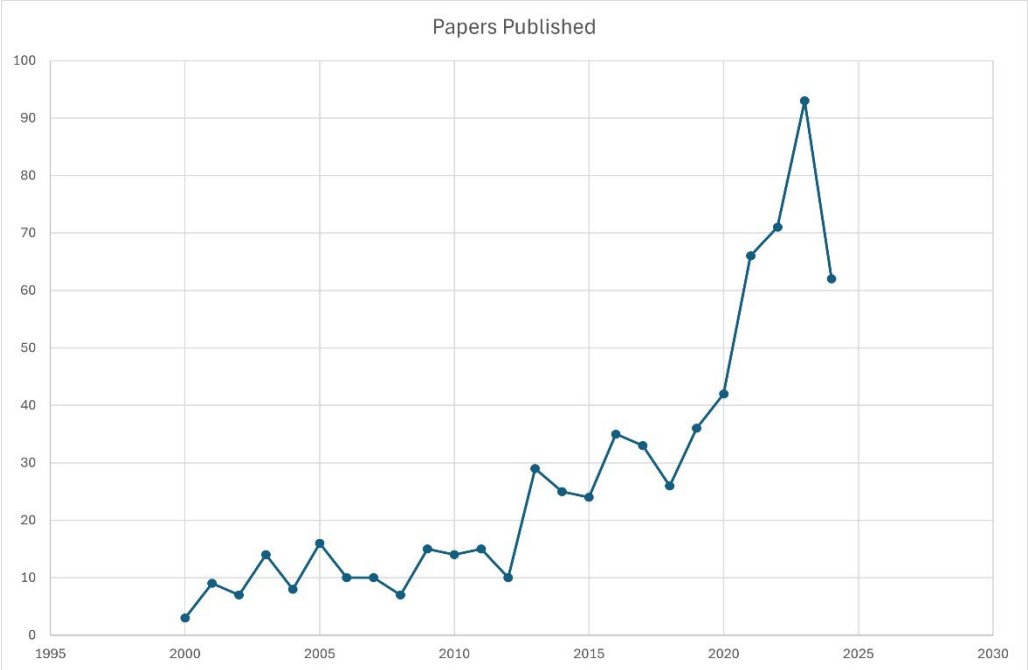


Figure 6. Paper published by title stock market from 2000 to 2024 (Author's own)

By demography

From our data collection we looked at the demographics of most of research conducted by the top 10 countries. Figure 6 shows that 64400 papers were published by the top 10 countries on this topic which accounts for about 40% of the total research among this USA have the most research on this topic of social media and stock market related followed

by China, United Kingdom, Germany and India. This demography shows that most research on this topic is done by top 10 economy of the global economy. Further ascertaining the importance of this topic.

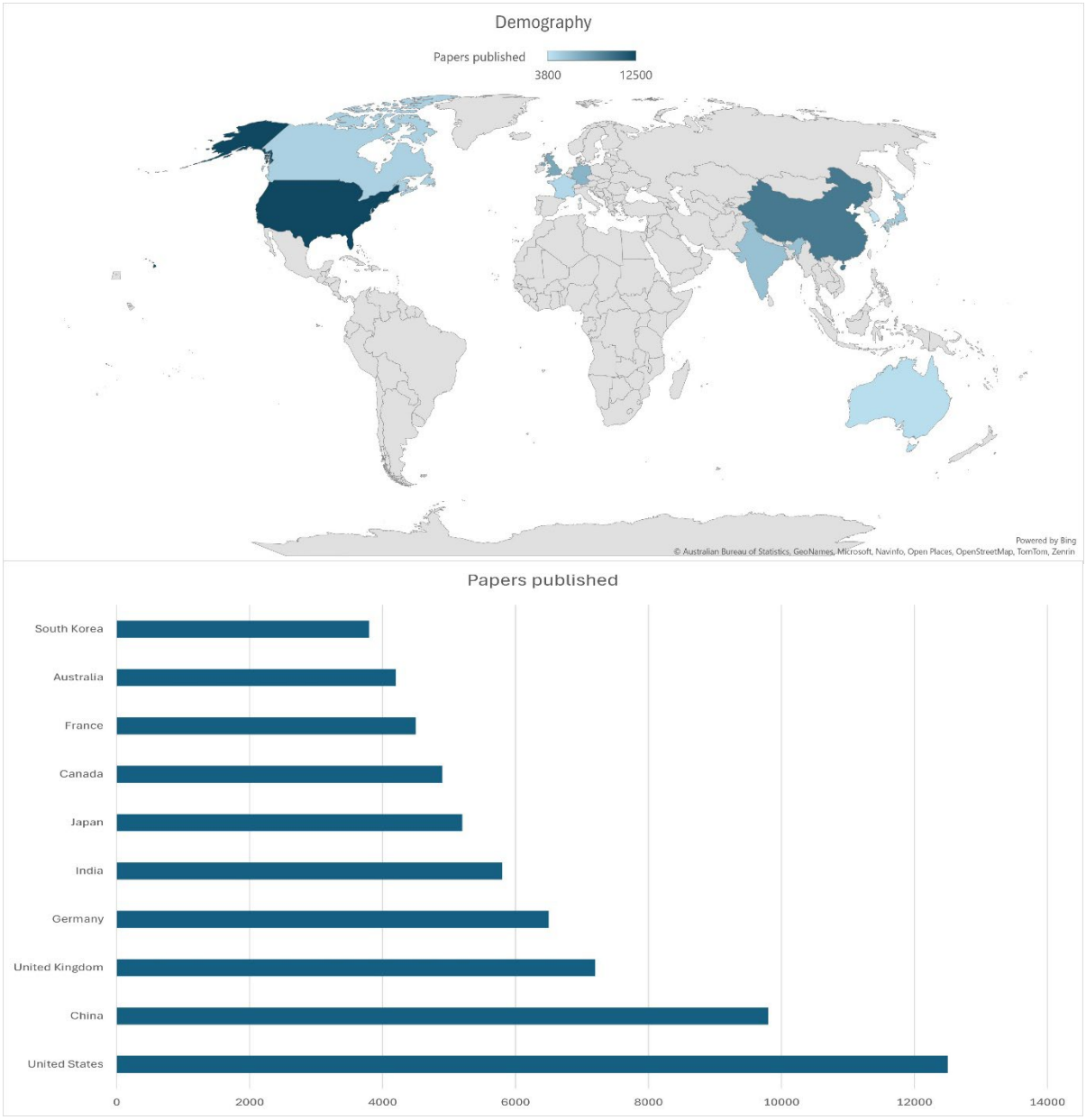


Figure 7. Top 10 countries published the paper on social media and stock market

3. Research Gap

In general, the current research on how social media affects the ups and downs of the stock market is seriously lacking, especially when analyzing positive sentiments. Some studies depict predictability, while others show that this is a problem in accurately predicting stock performance. Events characterized by positive sentiment in Reddit tend to decrease volatility, while high trading volume and prices increase volatility. Further, the influence of social media sentiment is differentiated between authenticated and non-authenticated users, with the former exerting a greater influence.(Kandasamy and Bechkoum 2024)(Liao and Huang 2023)(Yang 2023)(D. Kaya, Maramraju, and Nallapu 2023).

Most of the paper published in the topic of social media "and" stock market focused on analyzing only the platform Twitter or StockTwits (Kandasamy and Bechkoum 2024)(Avila 2023)(Bouadjenek, Sanner, and Wu 2023)(Duz Tan and Tas 2021). Also, another source analyzed is Reddit, especially the WallStreetBets community, which influences the stock market (G. G. Wang 2023) (Desiderio et al. 2021). Research in China also delves into the impact of Weibo sentiment on the returns of the stock market (Liao and Huang 2023). In Our paper we got only one paper exploring the connection of stock market with the platform Facebook (Karabulut 2012). While studies have focused on Twitter, there is still a gap in understanding the impact of other platforms like Facebook, Instagram and Reddit on stock price volatility.

Studies on social media influencers are predominantly conducted in the USA, Europe, and Asia, with China being the most studied region (Dewangan, Siddiqui, and Trehan 2022). Research articles on the topic of social media's influence on the stock market from India, Japan, and South Korea are also relevant but their number is notably limited compared to those from the USA, UK, and China. In the Asian setting, China is the only country where the relationship between social media and the stock market is considered to be in-depth. (Dewangan, Siddiqui, and Trehan 2022)(Liao and Huang 2023)(Zhang et al. 2022)(Xu et al. 2022)(WU et al. 2017).

Especially, social media data is able to predict the stock market performance while the result in the shorter rather than longer run of the forecast will be closer to real values (Bouadjenek, Sanner, and Wu 2023). Most of the studies are limited to relatively short data collection, dependence on a single platform, and limited social features(Bouadjenek, Sanner, and Wu 2023) (Duz Tan and Tas 2021).

Additionally, barely any research has been done on how social media activity during major world events—like the pandemic—affects stock market volatility (Markets 2023).

The study on the effectiveness of social media on stock market volatility has highlighted a few limitations that need further scholarly research. These include refining techniques of sentiment analysis, studying nonlinear relationships, investigating differences among various social media sites, and research ethics in data use. (Yang 2023). Moreover, the interplay between social media rumors and stock market volatility, as well as the development of efficient risk intervention models, presents another area for exploration (Zhang et al. 2022).

4. Methodology

4.1 Framework

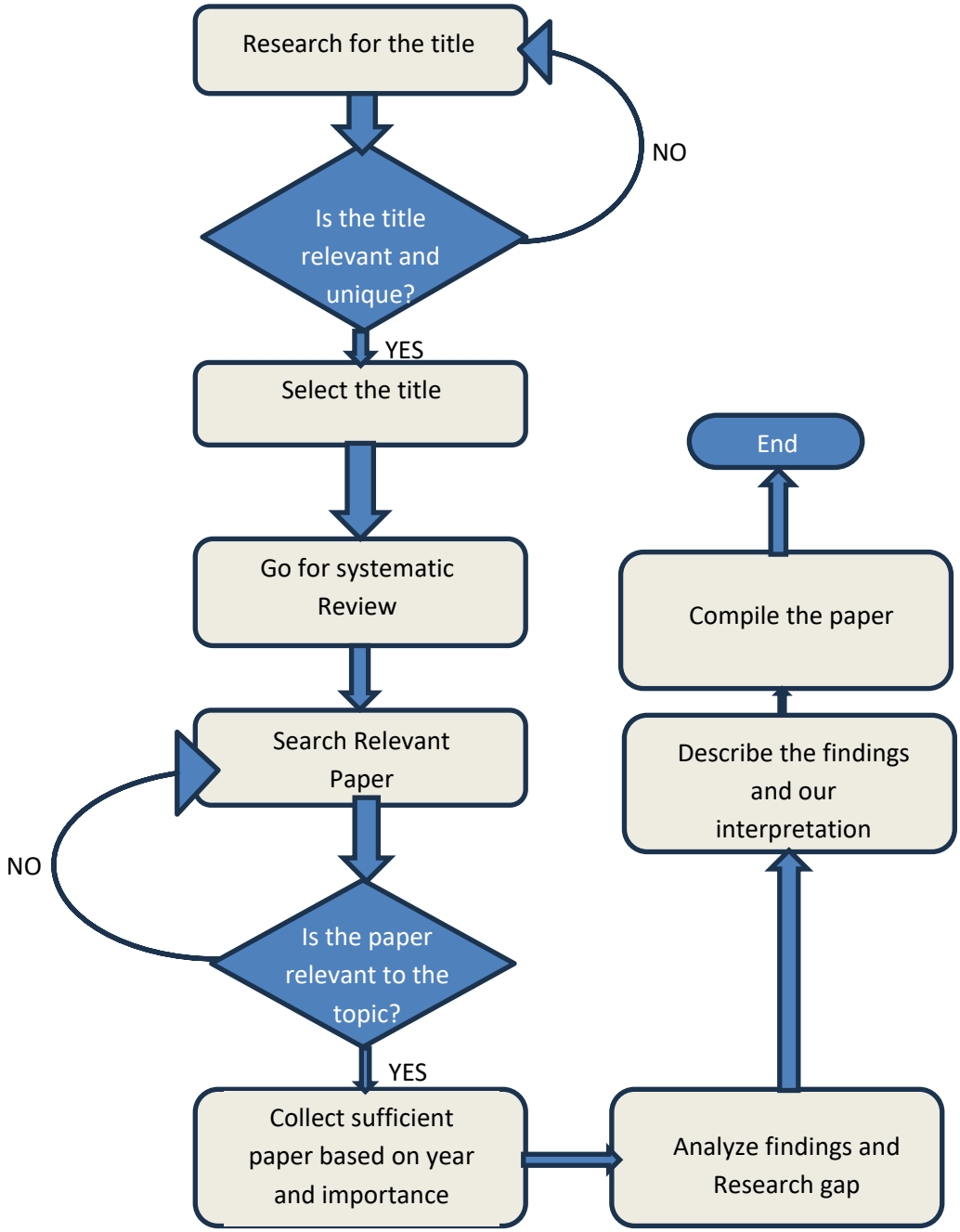


Figure 8. Process flowchart of our research methodology

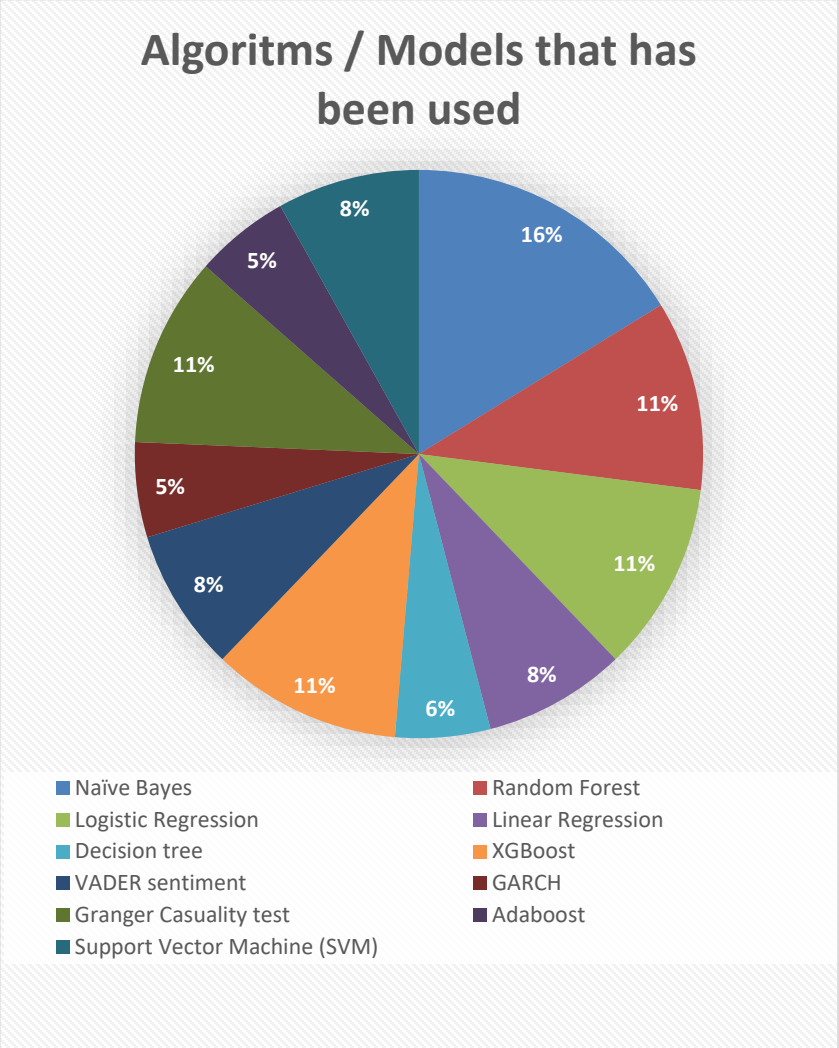
In the review paper, initially we collected and filtered the data at first by selecting relevant title. After selection of the title, we chose what type of paper we would compile and opted for a systematic review. As it is a systematic review, we searched relevant papers by keywords aligning with the title on Google scholar, Research Gate, Web of Science and other relevant journals. All the relevant papers were chosen, we then carefully analyzed these papers, extracting

and synthesizing the key findings. Finally, we compiled our paper, integrating our analysis and insights to present a comprehensive review.

4.2 Models and Algorithms

Table 2. How many times an Algorithms or Model has been used

Name of the Model or Algorithm	How many times it has been used
Naïve Bayes	18
Random Forest	12
Logistic Regression	12
Linear Regression	9
Decision tree	6
XGBoost	12
VADER sentiment	9
GARCH	6
Granger Causality test	12
Adaboost	6
Support Vector Machine (SVM)	9
Others	1



Based on the review of various research studies, various machine learning algorithms or models were used by the researchers, and they include a Linear Regression Model, Decision Tree, Adaboost, XGboost, Support Vector Classification (SVC), Naïve Bayes, Logistic Regression, Ridge Regression, Adaboost, Light-GBM, XG-Boost, Cat-Boost, Artificial Neural Networks, Support Vector Machine, Fuzzy Logic, Hybrid Algorithms, Genetic Algorithms, Ensemble Algorithms among others. More so, sentiment analysis is put into consideration in a wide area of application. The techniques being used in this study are VADER for sentiment analysis, Granger-causality tests, vector error correction models (Table 2).

Among them, the most famous is the Naïve Bayes Classifier, a set of algorithms for classification data with the help of Bayes' theorem. Along with XG-Boost, Random Forest, and logistic regression, the GARCH model is also in high use. Some of these methods were compared against each other to determine which gives the best results in stock trend prediction or the impact of the sentiment of social media on the stock performance.

5. Result

Most of the researchers analyzed impact social media on stock returns through sentiment analysis, explored the correlation between stock market movements and sentiments on Twitter or predicted stock market volatility using social media sentiment, extracted from tweets.

Utilizing sentiment analysis and deep learning techniques, researchers have successfully predicted stock market volatility by integrating historical prices with sentiment analysis of Twitter data (Saravanos and Kanavos 2023). Additionally, sentiment extracted from financial news and tweets has shown evidence of correlation with stock market movements, with sentiment from Twitter comments displaying a surprising strong negative correlation with future market volatility (Deveikyte et al. 2022). Meaning, as the sentiment on Twitter becomes more positive, market volatility tends to decrease and vice versa.

Different Sentimental analysis approaches are utilized in separate research. Most applied classifiers are Linear classifiers and probabilistic classifiers while the tweets were analyzed and labeled them for sentiment. Still, there was a huge improvement in the performance of models while using binary data instead of continuous one and also deep learning algorithms (RNN and LSTM) better models in prediction. Generally, it is observed that feature selection and reduction of spam tweets enhance the performance of most of the classifiers.

The accuracy ratio of Naive Bayes and logistics regression applied to the texture of data results in approximately 77% to 80%, respectively (Awan et al. 2021). XG-Boost yielded the highest R-squared (99.24%) and accuracy (99.23%) among all these algorithms. The linear regression came second, where it achieved R-squared at 98.02% and accuracy at 98.04%(Gurung et al. 2024). The Random Forest (RF) algorithm has proved to provide consistent results, so it can be recommended for the prediction of stock market trends(Khan et al. 2022). Moreover, the approaches like linear regression, random forest, and generalized linear regression produced more accurate outputs than the decision tree model(Awan et al. 2021). lso, approaches based on Artificial Neural Networks (ANN) and Deep Neural Networks (DNN) are primarily adopted because they can provide more accurate and faster predictions(Rouf et al. 2021). The effectiveness of Gaussian Naive Bayes (GNB) is enhanced when it is utilized in conjunction with feature extraction and scaling methodologies(Ampomah et al. 2021).

Using text-based features, emojis, words, and self-labeled sentiments, a machine learning classifier can predict beyond 20 days. Social media is more accurate at predicting the stock market in the short term than it is in the long term (Bouadjenek, Sanner, and Wu 2023). XGBoost and RF models are effective in predicting stock prices, with their accuracy increasing with an extended prediction window from 3 to 90 days. (Basak et al. 2019)

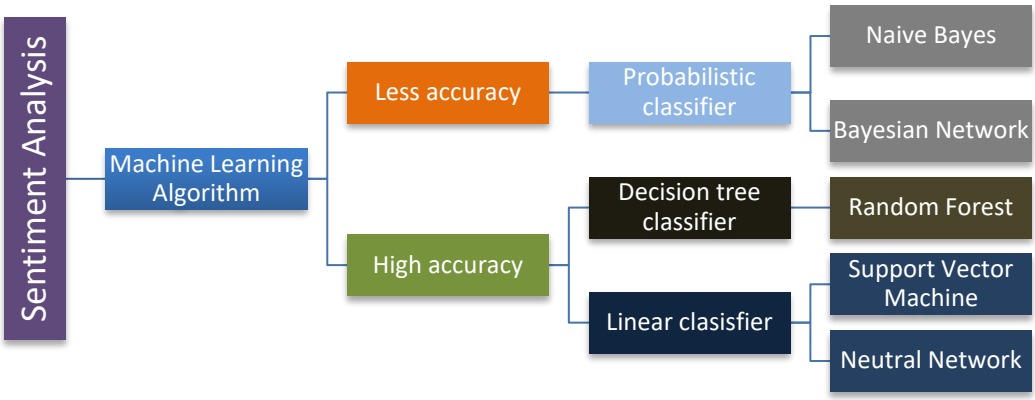


Figure 9. Result

6. Discussion

Social media becomes widely used to render volatility and stock market prediction with multifaceted impacts, hence developing a wide academic interest. A number of studies have indicated different ways in which social media influences market dynamics as market sentiment, information diffusion, and investor behavior (Figure 6- Figure 9).

Social Media Sentiment and Market Volatility

According to research, social media sentiment could significantly impact the yield of stocks, trading volumes, and overall market volatility. They show that, for example, social media events relate to some stocks lowering in volatility during positive events, and increasing during negative events (D. Kaya, Maramraju, and Nallapu 2023). The relationship between social media sentiment and patterns in the stock market can be quite complicated, with studies arriving at either predictive or at best weak/minimal or zero correlation (Yang 2023).

Behavioral finance theory supports these findings with the idea that expressed moods through social media can lead to irrational investor behaviors in affecting short-term stock fluctuations(Awan et al. 2021). Such complexity thus highlights the need for advanced methods of sentiment analysis to capture the nuances of the influence of social media. Information Dissemination and Influencing of Behaviors A more general prediction is that the speed of information diffusion on Twitter and Google significantly predicts intraday stock performance (Evangelos Vasileiou 2022). As such, such rapid flow of information clearly delineates social media as an important channel in investor attention and market activity. The social connectedness in word-of-mouth communication further influences decisions about participating in the stock market, emphasizing the critical role of social networks in making financial decisions(Hung 2020a). Most interestingly, GNH through Facebook emerged as an alternative measure of sentiment that managed to predict changes in US stock market returns, although long-term sustainability appears to be debatable (Karabulut 2012).

Predictive Models and Frameworks

Some of the innovative frameworks developed by researchers combine social media information with macroeconomic indicators to enhance the accuracy of stock prediction.

For instance, the predictability of the ECON model has improved in light of better-quality data and sector correlations (S. Wang et al. 2023). Empirically it has been observed that Twitter talks can predict market volumes which are implying the usefulness of sentiment in social media for the analysis of finance (Vicentini et al. 2024).
In addition, technical and fundamental analyses are essential in predicting stock markets; the latter is also increasingly using sentiment analysis obtained from social media sites.

Various machine learning models have been applied in stock market prediction, among which the Naive Bayes classifier shows high reliability in assessing the performance of stock market analysts for the stock market (Zhang et al. 2022). Random Forests (RF) give satisfying results for big datasets, but very often, Naive Bayes presents higher accuracy with small datasets (Soni, Tewari, and Krishnan 2022). In contrast, there exist advanced models such as XGBoost that have shown exceptional accuracy, thus allowing their application to manage stock portfolios and to design new strategies on trading (Basak et al. 2019). Research has identified that social media coverage is related to higher idiosyncratic volatility and trading volume in stock markets (Jiao, Veiga, and Walther 2020) however, in terms of where social media is potentially able to exert influence, it appears to have a much stronger short-term effect that eventually dissipates over time(WU et al. 2017) . In fact, not only does predicting fluctuations in stock markets pose a number of challenges with the data acquisition, live testing, and rapid evolution of algorithms that such developments can drive (Rouf et al. 2021). Implications for Marketers and Investors.

However, open dialogue with consumers is of utmost importance for adding value in the social media space. All traditional methods of marketing are giving way to customer relationship marketing, and subtle ads allow the marketers to work their way around consumer resistance to messages (Wright et al. 2010).

As a result, only the consideration of these factors jointly identified - market sentiments, behavioral influences, information dissemination, and social connectivity - collectively could explain how social media impacts on stock market volatility and predictions. Social media, therefore, with a rising dominance of studies in this regard, is one of the most critical areas where understanding the dynamics and varied market behaviors are pertinent to investors and marketers alike. Future research should enhance the methodologies for sentiment analysis and test the long-run sustainability of emerging measures such as GNH in predicting stock market activities.

7. Future Research Work

Most of the existing studies were based on sentiment extraction mainly from Twitter or StockTwit, though other social media platforms could be integrated for such extraction. The study shall enable an analysis regarding the impact of other social media platforms such as Facebook, Instagram, and Reddit on the stock market. These are platforms

independent of user composition, whereby each platform provides its perspective on how such sentiments influence the movement of a stock market and, thus, helps increase the precision of market prediction based on social media activity.

Machine learning classifier such as Deep neural network DNN model, Artificial neural network ANN model, Support Vector Classifier SVC model, which are seldom used in researching this topic, provide us with a higher accuracy.
Most of the existing research on the impact of social media upon stock markets talks to developed regions like the USA, Europe, and China. There is also a need to explore its influence in third-world countries with unstable economies. This area provides unique conditions concerning diverse demographics, economic instability, emerging markets, cultural differences, limited access to technology, and tighter government control, which would actually lead to different patterns of stock market behavior.

Reference

Abu-Taleb, Safa Khalil, and Fredrick Nilsson. "Impact of Social Media on Investment Decision a Quantitative Study Which Considers Information Online, Online Community Behavior, and Firm Image." *UMEA University*, 64. 2021.

Adedoyin Tolulope Oyewole, Omotayo Bukola Adeoye, Wilhelmina Afua Addy, Chinwe Chinazo Okoye, Onyeka Chrisanctus Ofodile, and Chinonye Esther Ugochukwu. "Predicting Stock Market Movements Using Neural Networks: A Review and Application Study." *Computer Science & IT Research Journal* 5 (3): 651–70. 2024.https://doi.org/10.51594/csitrj.v5i3.912.

Agarwal, Shweta, Shailendra Kumar, and Utkarsh Goel. Stock Market Response to Information Diffusion through Internet Sources: A Literature Review." *International Journal of Information Management* 45 (November 2017): 118–31. 2019. "https://doi.org/10.1016/j.ijinfomgt.2018.11.002.

———. "Social Media and the Stock Markets: An Emerging Market Perspective." *Journal of Business Economics and Management* 22 (6): 1614–32. 2021. https://doi.org/10.3846/jbem.2021.15619.

Alhajj, Reda. "Advanced Technology and Social Media Influence on Research, Industry and Community." *IFIP Advances in Information and Communication Technology* 522:1–9. 2018. https://doi.org/10.1007/978-3-319-89743-1_1.

Alves, Helena, Cristina Fernandes, and Mário Raposo. "Social Media Marketing: A Literature Review and Implications." *Psychology and Marketing* 33 (12): 1029–38. 2016.https://doi.org/10.1002/mar.20936.

Ampomah, Ernest Kwame, Gabriel Nyame, Zhiguang Qin, Prince Clement Addo, Enoch Opanin Gyamfi, and Michael Gyan. "Stock Market Prediction with Gaussian Naïve Bayes Machine Learning Algorithm." *Informatica (Slovenia)* 45 (2): 243–56. 2021. https://doi.org/10.31449/inf.v45i2.3407.

Asghar, Muhammad Zubair, Fazal Rahman, Fazal Masud Kundi, and Shakeel Ahmad. "Development of Stock Market Trend Prediction System Using Multiple Regression." *Computational and Mathematical Organization Theory* 25 (3): 271–301. 2019. https://doi.org/10.1007/s10588-019-09292-7.

Avila, C Sarai R. "Tweet Influence on Market Trends : Analyzing the Impact of Social Media Sentiment on Biotech Stocks." 2023.

Awan, Mazhar Javed, Mohd Shafry Mohd Rahim, Haitham Nobanee, Ashna Munawar, Awais Yasin, and Azlan Mohd Zain. "Social Media and Stock Market Prediction: A Big Data Approach." *Computers, Materials and Continua* 67 (2): 2569–83. 2021.https://doi.org/10.32604/cmc.2021.014253.

Basak, Suryoday, Saibal Kar, Snehanshu Saha, Luckyson Khaidem, and Sudeepa Roy Dey. "Predicting the Direction of Stock Market Prices Using Tree-Based Classifiers." *North American Journal of Economics and Finance* 47 (January):552–67. 2019. https://doi.org/10.1016/j.najef.2018.06.013.

Bentolila, Alan, and Todd Thompkins. "A Comparative Analysis Between the Influence of Social Media and Mass Media on the Stock Market." *Journal of Student Research* 11 (3): 1–16. 2022.https://doi.org/10.47611/jsrhs.v11i3.3430.

Bhadamkar, Amey, and Sonali Bhattacharya. "Tesla Inc. Stock Prediction Using Sentiment Analysis." *Australasian Accounting, Business and Finance Journal* 16 (5): 52–66. 2022.https://doi.org/10.14453/aabfj.v16i5.05.

Bhandare, Yash, Sumit Bharsawade, Dhurv Nayyar, Omkar Phadtare, and Deipali Gore. "SMART : Stock Market Analyst Rating Technique Using Naive Bayes Classifier," 3–6. 2020.

Bhowmik, Debesh. "Stock Market Volatility: An Evaluation." *International Journal of Scientific and Research Publications* 3 (10): 1–18. 2013.

Bouadjenek, Mohamed Reda, Scott Sanner, and Ga Wu. "A User-Centric Analysis of Social Media for Stock Market Prediction." *ACM Transactions on the Web* 17 (2). 2023. https://doi.org/10.1145/3532856.

Canadian, T H E, and Energy Sector. "By Diego Corry B . A . (with Distinction), The University of British Columbia , 2022 a thesis submitted in partial fulfillment of the requirements for the degree of master of science in the faculty of graduate and postdoctoral studies (forestry) the u," no. June. 2024.

Carr, Caleb T., and Rebecca A. Hayes. "Social Media: Defining, Developing, and Divining." *Atlantic Journal of Communication* 23 (1): 46–65. 2015.https://doi.org/10.1080/15456870.2015.972282.

Chahine, Salim, and Naresh K. Malhotra. "Impact of Social Media Strategies on Stock Price: The Case of Twitter." *European Journal of Marketing* 52 (7–8): 1526–49. 2018.https://doi.org/10.1108/EJM-10-2017-0718.

Coyne, Scott, Praveen Madiraju, and Joseph Coelho. "Forecasting Stock Prices Using Social Media Analysis." *Proceedings - 2017 IEEE 15th International Conference on Dependable, Autonomic and Secure Computing, 2017 IEEE 15th International Conference on Pervasive Intelligence and Computing, 2017 IEEE 3rd International Conference on Big Data Intelligence and Compu* 2018-Janua:1031–38. 2017. https://doi.org/10.1109/DASC-PICom-DataCom-CyberSciTec.2017.169.

Cruz, Richard, Johnson Kinyua, and Charles Mutigwe. "Analysis of Social Media Impact on Stock Price Movements Using Machine Learning Anomaly Detection." *Intelligent Automation and Soft Computing* 36 (3): 3405–23. 2023. https://doi.org/10.32604/iasc.2023.035906.

Czapkiewicz, Anna, and Agnieszka Choczyńska. "The Effect of Financial, Macroeconomic and Sentimental Factors on Stock Market Volatility." *Przegląd Statystyczny* 67 (4): 274–93. 2021. https://doi.org/10.5604/01.3001.0014.8492.

D. Kaya, Halil, Abhinav Maramraju, and Anish Nallapu. "The Impact of Social Media Related Events on the Price Volatility of Mega-Cap Technology Stocks." *Financial Markets, Institutions and Risks* 7 (4): 14–23. 2023.https://doi.org/10.61093/fmir.7(4).14-23.2023.

Desiderio, Antonio, Luca Maria, Giulio Cimini, and Laura Alessandretti. "The Causal Role of the Reddit Collective Action on the GameStop Short Squeeze," 1–34. 2021.

Deveikyte, Justina, Helyette Geman, Carlo Piccari, and Alessandro Provetti. "A Sentiment Analysis Approach to the Prediction of Market Volatility." *Frontiers in Artificial Intelligence* 5. 2022. https://doi.org/10.3389/frai.2022.836809.

Dewangan, Jay Kumar, Imran Nadeem Siddiqui, and Udita Trehan. "SOCIAL MEDIA INFLUENCER MARKETING: A SYSTEMATIC LITERATURE REVIEW." *International Journal of Business Excellence* 1 (1): 1. https://doi.org/10.1504/ijbex.2022.10045019. 2022.

Duz Tan, Selin, and Oktay Tas. "Social Media Sentiment in International Stock Returns and Trading Activity." *Journal of Behavioral Finance* 22 (2): 221–34. 2021. https://doi.org/10.1080/15427560.2020.1772261.

Evangelos Vasileiou. "Explaining Gamestop Short Squeeze Using Intraday Data and Google Searches." *Journal of Prediction Market*, 17. 2022.https://doi.org/https://dx.doi.org/10.2139/ssrn.3805630.

Garg, Deepshi, and Prakash Tiwari. "Impact of Social Media Sentiments in Stock Market Predictions : A Bibliometric Analysis" 38 (4): 170–82. 2021.https://doi.org/10.1177/02663821211058666.

Godey, Bruno, Aikaterini Manthiou, Daniele Pederzoli, Joonas Rokka, Gaetano Aiello, Raffaele Donvito, and Rahul Singh. "Social Media Marketing Efforts of Luxury Brands: Influence on Brand Equity and Consumer Behavior." *Journal of Business Research* 69 (12): 5833–41. 2016.https://doi.org/10.1016/j.jbusres.2016.04.181.

Guo, Hui. 2002. "Stock Market Volatility: Reading the Meter." *Economic Synopses* 2002 (6): 2002. https://doi.org/10.20955/es.2002.6.

Gurung, Nisha, Rokibul Hasan, ✉ Md, Sumon Gazi, and Md Zahidul Islam. "Journal of Business and Management Studies Algorithmic Trading Strategies: Leveraging Machine Learning Models for Enhanced Performance in the US Stock Market." 2024. https://doi.org/10.32996/jbms.

Hao, Zhicheng, and Yun Heh Jessica Chen-Burger. "An Investigation into Influences of Tweet Sentiments on Stock Market Movements." *Smart Innovation, Systems and Technologies* 306:87–97. 2022. https://doi.org/10.1007/978-981-19-3359-2_8.

Hewamana, Ranil, Dinesha Siriwardhane, and Ananda Rathnayake. "Determinants of Stock Price Volatility: A Literature Review." *South Asian Journal of Finance* 2 (1): 28–55. 2022. https://doi.org/10.4038/sajf.v2i1.44.

Hung, Chih-ching. "Does Social Connectedness Affect Stock Market Participation ?," no. 646. 2020a.

———. 2020b. "Hung-WP-2020," no. 646.

Index, Volatility, and Indian Capital. "ISSN : 2249-0558 ISSN : 2249-0558" 2 (9): 417–25. 2012.

Jermsittiparsert, Kittisak, Warat Karuchit, Hassaporn Thongdaeng, Shafaq Fatema, Li Yanbin, and Dong Fugui. n.d. "OPEN ACCESS EDITED BY Social Media Influence on Politicians' and Citizens' Relationship through the Moderating Eeect of Political Slogans."

Jiao, Peiran, André Veiga, and Ansgar Walther. "Social Media, News Media and the Stock Market." *Journal of Economic Behavior and Organization* 176:63–90. 2020. https://doi.org/10.1016/j.jebo.2020.03.002.

Kandasamy, Theeshanthani, and Kamal Bechkoum. "Impact of Social Media Sentiments on Stock Market Behavior : A Machine Learning Approach to Analyzing Market Dynamics" 00 (April): 1–12. 2024.https://doi.org/10.47852/bonviewJCBAR42022006.

Karabulut, Yigitcan. "Can Facebook Predict Stock Market Activity?" *SSRN Electronic Journal*. 2012.https://doi.org/10.2139/ssrn.2017099.

Khan, Wasiat, Mustansar Ali Ghazanfar, Muhammad Awais Azam, Amin Karami, Khaled H. Alyoubi, and Ahmed S. Alfakeeh. "Stock Market Prediction Using Machine Learning Classifiers and Social Media, News." *Journal of Ambient Intelligence and Humanized Computing* 13 (7): 3433–56. 2022.https://doi.org/10.1007/s12652-020-01839-w.

Kumbure, Mahinda Mailagaha, Christoph Lohrmann, Pasi Luukka, and Jari Porras. "Machine Learning Techniques and Data for Stock Market Forecasting: A Literature Review." *Expert Systems with Applications*. 2022.Elsevier Ltd. https://doi.org/10.1016/j.eswa.2022.116659.

Li, Daifeng, Yintian Wang, Andrew Madden, Ying Ding, Jie Tang, Gordon Guozheng Sun, Ning Zhang, and Enguo Zhou. "Analyzing Stock Market Trends Using Social Media User Moods and Social Influence." *Journal of the Association for Information Science and Technology* 70 (9): 1000–1013. 2019.https://doi.org/10.1002/asi.24173.

Li, Sijia, Yuping Wang, Zifan Zhang, and Yiming Zhu. "Research on the Factors Affecting Stock Price Volatility." *Proceedings of the 2022 7th International Conference on Financial Innovation and Economic Development (ICFIED 2022)* 648 (Icfied): 2884–89. 2022.https://doi.org/10.2991/aebmr.k.220307.469.

Liao, Lin, and Tao Huang. "The Impact of Social Media Sentiment on Stock Market Based on User Classification." *Frontiers in Artificial Intelligence and Applications* 367:1–16. 2023.https://doi.org/10.3233/FAIA230002.

Mai, Feng, Zhe Shan, Qing Bai, Xin (Shane) Wang, and Roger H.L. Chiang. "How Does Social Media Impact Bitcoin Value? A Test of the Silent Majority Hypothesis." *Journal of Management Information Systems* 35 (1): 19–52. 2018. https://doi.org/10.1080/07421222.2018.1440774.

Mancini, Anna, Antonio Desiderio, Giovanni Palermo, Riccardo Di Clemente, and Giulio Cimini. "The Rise and Fall of WallStreetBets: Social Roles and Opinion Leaders across the GameStop Saga," no. January. 2024.

Markets, Foundation. "Impact of Social Media and Google on Stock Markets During a Pandemic : The Case of an Airline" 27 (5): 128–39. 2023.https://doi.org/10.26794/2587-5671-2023-27-5-128-139.

Nabipour, Mojtaba, Pooyan Nayyeri, Hamed Jabani, S. Shahab, and Amir Mosavi. "Predicting Stock Market Trends Using Machine Learning and Deep Learning Algorithms Via Continuous and Binary Data; A Comparative Analysis." *IEEE Access* 8:150199–212. 2020. https://doi.org/10.1109/ACCESS.2020.3015966.

Naeini, Mahdi Pakdaman, Hamidreza Taremian, and Homa Baradaran Hashemi. Stock Market Value Prediction Using Neural Networks." *2010 International Conference on Computer Information Systems and Industrial Management Applications, CISIM 2010*, 132–36. 2010. "https://doi.org/10.1109/CISIM.2010.5643675.

Nazeri, Kamyar. "Effect of Social Media on Opinion Formation." 2018.

Nti, Isaac Kofi, Adebayo Felix Adekoya, and Benjamin Asubam Weyori. "A Systematic Review of Fundamental and Technical Analysis of Stock Market Predictions." *Artificial Intelligence Review* 53 (4): 3007–57. 2020.https://doi.org/10.1007/s10462-019-09754-z.

Nyakurukwa, Kingstone, and Yudhvir Seetharam. "The Evolution of Studies on Social Media Sentiment in the Stock Market: Insights from Bibliometric Analysis." *Scientific African*. Elsevier B.V. 2023.https://doi.org/10.1016/j.sciaf.2023.e01596.

October, On. 1990. "Schwert1990 (1)," no. June, 23–34.

Okonkwo, Ifeanyi, and Hisham Abubaker Awad. The Role of Social Media in Enhancing Communication and Collaboration in Business." *Journal of Digital Marketing and Communication* 3 (1): 19–27. 2023. "https://doi.org/10.53623/jdmc.v3i1.247.

Oriakhi, Osasumwen Pamela, Aamir Amin, and Sohail Safdar. "Negative Impact of Social Media Advertisements on Branding in Digital Marketing." *2023 International Conference on IT Innovation and Knowledge Discovery, ITIKD 2023*. https://doi.org/10.1109/ITIKD56332.2023.10099505.

Pagolu, Venkata Sasank, Kamal Nayan Reddy, Ganapati Panda, and Babita Majhi. "Sentiment Analysis of Twitter Data for Predicting Stock Market Movements." *International Conference on Signal Processing, Communication, Power and Embedded System, SCOPES 2016 - Proceedings*, 1345–50. 2017.https://doi.org/10.1109/SCOPES.2016.7955659.

Piotroski, Joseph D, and Darren T Roulstone. "Piotroski and Roulstone The Accounting Review." *The Accounting Review* 79 (4): 1119–51. 2004.

Qian, Bo, and Khaled Rasheed. "Stock Market Prediction with Multiple Classifiers." *Applied Intelligence* 26 (1): 25–33. 2007.https://doi.org/10.1007/s10489-006-0001-7.

Ranco, Gabriele, Darko Aleksovski, Guido Caldarelli, Miha Grčar, and Igor Mozetič. "The Effects of Twitter Sentiment on Stock Price Returns." *PLoS ONE* 10 (9): 1–21. 2015.https://doi.org/10.1371/journal.pone.0138441.

REJMAN, Krzysztof, and Mateusz PORADA. "Social Media – a New Era of Communication." *Humanities and Social Sciences Quarterly* 29 (2): 43–49. 2022. https://doi.org/10.7862/rz.2022.hss.11.

Rhoda Adura Adeleye, Tula Sunday Tubokirifuruar, Binaebi Gloria Bello, Ndubuisi Leonard Ndubuisi, Onyeka Franca Asuzu, and Oluwaseyi Rita Owolabi. "Machine Learning for Stock Market Forecasting: A Review of Models and Accuracy." *Finance & Accounting Research Journal* 6 (2): 112–24. 2024.https://doi.org/10.51594/farj.v6i2.783.

Rouf, Nusrat, Majid Bashir Malik, Tasleem Arif, Sparsh Sharma, Saurabh Singh, Satyabrata Aich, and Hee Cheol Kim. "Stock Market Prediction Using Machine Learning Techniques: A Decade Survey on Methodologies, Recent Developments, and Future Directions." *Electronics (Switzerland)*. MDPI. https://doi.org/10.3390/electronics10212717. 2021.

S, Sreejesh, Justin Paul, Carolyn Strong, and Jose Pius. "Consumer Response towards Social Media Advertising: Effect of Media Interactivity, Its Conditions and the Underlying Mechanism." *International Journal of Information Management* 54 (October). 2020. https://doi.org/10.1016/j.ijinfomgt.2020.102155.

Saravanos, Christina, and Andreas Kanavos. "Forecasting Stock Market Alternations Using Social Media Sentiment Analysis and Deep Neural Networks." *14th International Conference on Information, Intelligence, Systems and Applications, IISA 2023*, 1–8. 2023. https://doi.org/10.1109/IISA59645.2023.10345902.

Sarder Abdulla Al Shiam, Md Mahdi Hasan, Md Boktiar Nayeem, M. Tazwar Hossian Choudhury, Proshanta Kumar Bhowmik, Sarmin Akter Shochona, Ahmed Ali Linkon, Md Murshid Reja Sweet, and Md Rasibul Islam. "Deep Learning for Enterprise Decision-Making: A Comprehensive Study in Stock Market Analytics." *Journal of Business and Management Studies* 6 (2): 153–60. 2024.https://doi.org/10.32996/jbms.2024.6.2.15.

Sartaj Hussain, K. V. Bhanu Murthy, and Amit Singh. "Stock Market Volatility: A Review of the Empirical Literature." *IUJ Journal of Management* 7 (1): 96–105. 2019.

Soni, Payal, Yogya Tewari, and Deepa Krishnan. "Machine Learning Approaches in Stock Price Prediction: A Systematic Review." In *Journal of Physics: Conference Series*. Vol. 2161. IOP 2022. Publishing Ltd. https://doi.org/10.1088/1742-6596/2161/1/012065.

Thakkar, Ankit, and Kinjal Chaudhari. "A Comprehensive Survey on Deep Neural Networks for Stock Market: The Need, Challenges, and Future Directions." *Expert Systems with Applications* 177 (February): 114800. 2021. https://doi.org/10.1016/j.eswa.2021.114800.

Tuhuteru, Laros, Imman Yusuf Sitinjak, Tukiyo Tukiyo, Rosita Nainggolan, and Hermans Gavin. "The Impact of Social Media and Its Influence in the World of Education." *Al-Fikrah: Jurnal Manajemen Pendidikan* 11 (1): 33. 2023. https://doi.org/10.31958/jaf.v11i1.8638.

Vicentini, Giulio, Alessandro Nucci, Guido Caldarelli, and Elisa Omodei. "Ep Rin t n Ot Pe Er r Ev Pr Ep Rin t n Ot Pe Er r Ed." 2024. https://doi.org/https://dx.doi.org/10.2139/ssrn.4824781.

Wang, Guiling Grace. "HODL : The Hold of Reddit Over the Stock Market." *2023 IEEE 39th International Conference on Data Engineering Workshops (ICDEW)*, 36–39. 2023. https://doi.org/10.1109/ICDEW58674.2023.00010.

Wang, Shengkun, Yangxiao Bai, Taoran Ji, Kaiqun Fu, Linhan Wang, and Chang-tien Lu. 2023. "Stock Movement and Volatility Prediction from Tweets , Macroeconomic Factors and Historical Prices."

Wanjawa, B. W., and L. Muchemi. "ANN Model to Predict Stock Prices at Stock Exchange Markets," 1–23. 2014.

Wright, Elizabeth, Nile M. Khanfar, Catherine Harrington, and Lee E. Kizer. "The Lasting Effects Of Social Media Trends On Advertising." *Journal of Business & Economics Research (JBER)* 8 (11). 2010. https://doi.org/10.19030/jber.v8i11.50.

WU, Xianjiao, Xiaolin WANG, Shudong MA, and Qiang YE. "The Influence of Social Media on Stock Volatility." *Frontiers of Engineering Management* 4 (2): 201. https://doi.org/10.15302/j-fem-2017018. 2017.

Xu, Qifa, Qianqian Li, Cuixia Jiang, Jun Wu, and Xin Zhang. "Social Media, Interaction Information and Stock Market Efficiency: Evidence from the Shenzhen Stock Exchange Easy Interaction Platform in China." *Asia-Pacific Journal of Accounting and Economics* 29 (6): 1469–96. 2022.https://doi.org/10.1080/16081625.2020.1829976.

Yang, Zhengxin. "The Relationship Between Social Media Data and Stock Market Volatility" 0:14–20. 2023.https://doi.org/10.54254/2754-1169/30/20231413.

Zhang, Hua, Yuanzhu Chen, Wei Rong, Jun Wang, and Jinghua Tan. "Effect of Social Media Rumors on Stock Market Volatility: A Case of Data Mining in China." *Frontiers in Physics* 10 (August). 2022.https://doi.org/10.3389/fphy.2022.987799.

Biographies

Asir Mubasshir Ishrak is a student at the Military Institute of Science and Technology, Dhaka, Bangladesh, under Industrial and Production Engineering. His name is pretty much synonymous with academics and participation in different competitions throughout college life, which he secured at very commendable positions. A leading debater in MIST, he claims high articulate proficiency in spoken English and sound critical thinking ability. He has also been awarded a 60% scholarship on performance in the ISCEA Certified Supply Chain Analyst competition, hence proving his mettle in this field. Machine learning processes and operations research are his academic interests, and he aims to contribute a great deal to it. Besides academics, Asir had a host of other enviable skills: his photos getting selected for several international exhibitions showcasing PicsArt-skills, showing that he had an eye for shooting photos; running half marathons, proving how unwavering and fit he was; and his participation in the Olympiad, which spoke volumes about eclectic intellectual interests he had. He also participated in business case competitions and emerged as a runner-up in the Hult On Campus round, evoking his strategic thinking and problem-solving skills.Perhaps it is the curiosity in intellect, competitive spirit, and a host of other interests which will help him create an enviable path ahead for Asir Mubasshir Ishrak.

Tasfia Islam Tinni is a currently pursuing a Bachelor of Science in Industrial and Production Engineering at Military Institute of Science and Technology (MIST). Keen interest that she shows for Optimization Algorithms and Data Analysis marks one of her distinctive features observable throughout her academic career. Tasfia is actively enhancing her skills in Project Management and Lean Management, with a focused effort on mastering Six Sigma tools. With great enthusiasm, she is committed to learning and practical problem-solving approaches on a large scale in order to be able to contribute meaningfully and make an impact in the exciting and broad fields of Industrial and Production Engineering.

Samiha Mumtaj is an undergraduate student at the Military Institute of Science and Technology (MIST) in Dhaka, Bangladesh, majoring in Industrial and Production Engineering. Renowned for her academic dedication and active involvement in various clubs and activities, Samiha has made significant contributions both within and outside her academic environment. As a keen reader and writer, Samiha has always found joy in the world of books and writings. She was one of the founding core members of the English Language Club at her college, BNMPC, and played a crucial role in organizing an online event during the COVID-19 pandemic, showcasing her leadership and organizational skills. Samiha's interests extend beyond literature. She has a certain appreciation for arts and aesthetics, and she enjoys expressing her creativity through video and photo editing. During her high school years, she was an active member of the Social Service Club, demonstrating her commitment to community service, on behalf of which, she contributed in Organizing a fund raising event and collected donations for the flood affected people in 2018. At MIST, she is involved in the MIST Career Club and the MIST Readers Club, reflecting her diverse interests and engagement in campus life. With a blend of intellectual curiosity, creativity, and a commitment to making a positive impact, Samiha Mumtaj is well on her way to achieving remarkable success in her chosen field.

Monisha Rani Dey is an ambitious and dedicated student at Military Institute of Science and Technology, pursuing a degree in Industrial and Production Engineering. Known for her strong academic focus and determination, Monisha has consistently showcased a passion for innovation and problem-solving in the field of engineering. Growing up in a backdrop where education and hard work were regarded as the prime factor for success, Monisha learned to balance academics with her personal growth quite efficiently. She is interested in industrial systems, manufacturing processes, and efficiency optimization, which inspires her academic pursuits. Her analytical bent of mind coupled with creative thinking has brought her to the front among her peers and professors alike. Apart from academics, Monisha enjoys understanding new ideas and enhancing her technical skills to apply them to any project that brings value to life. With an uncompromising commitment and a forward-looking attitude, Monisha strives for excellence in professional life and intends to give valuable contributions to the stream of Industrial and Production Engineering.