

StocksPI: A Smart Platform for Beginner Stock Market Investors

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Abstract—In today’s financial landscape, the percentage of young individuals actively investing in the stock market remains significantly low. Many beginners, especially students and early age earners, hesitate to invest due to fear, lack of proper knowledge, and confusion regarding market functioning. This gap between interest and action inspired the development of StocksPI, a beginner-friendly stock market guidance system designed to simplify investment decision-making. However, the system operates within regulatory limitations. According to the Securities and Exchange Board of India (SEBI) regulations, particularly under the Investment Advisers framework introduced in 2013, providing direct buy or sell stock tips without proper authorization is restricted. Therefore, StocksPI does not provide direct trading recommendations but instead focuses on offering analytical guidance and educational support to users. The proposed system integrates Machine Learning algorithms and sentiment analysis techniques to evaluate stock trends and market behavior. By processing historical data and market sentiment, the system generates analytical insights rather than direct investment advice. A key feature of StocksPI is “Constant Pie,” an AI-based assistant designed to continuously assist users by answering queries, explaining market concepts, and guiding beginners throughout their learning journey. Existing trading and investment applications often assume prior knowledge of financial markets, making them difficult for first-time investors to use effectively. StocksPI addresses this issue by combining predictive analytics with an interactive AI assistant to enhance accessibility and user confidence. The results indicate that such a guidance-based system can reduce the psychological barrier associated with stock market investment and encourage informed participation. By empowering users with structured insights and educational assistance, StocksPI aims to help beginners understand market dynamics and navigate investment decisions more confidently.

I.INTRODUCTION

The stock market is one of the most powerful financial systems for wealth creation and economic development. In India, stock trading has become digitally accessible through platforms such as Zerodha and Upstox. Despite this technological growth, active participation among young individuals remains relatively low.

One of the major problems in today’s stock market ecosystem is the psychological and informational barrier faced by beginners. Many young individuals are interested in investing but hesitate due to fear of loss, lack of structured guidance, and confusion caused by market volatility. The stock market is often perceived as risky and unpredictable, especially by first-time investors. Sudden price fluctuations, misleading social media tips, emotional trading decisions, and absence of proper financial education further increase this hesitation.

Another significant issue is information overload. Beginners are exposed to complex charts, technical indicators, financial ratios, and economic news without proper explanation. While numerous trading applications provide execution facilities, very few focus on simplifying analysis and building conceptual clarity. As a result, new investors either avoid the market entirely or make uninformed decisions based on incomplete understanding. To address these challenges, we propose StocksPI, an AI-based stock analysis and guidance system designed specifically for beginner-level investors. The system performs next-day stock prediction using multiple Machine Learning algorithms. By comparing outputs from various models, the system identifies consistent predictive

patterns. Experimental observations indicate that the prediction results show high trend similarity approaching 99% consistency under tested datasets which helps in building user trust in the analytical framework. StocksPI collects real-time and historical market data from Yahoo Finance to ensure that predictions are based on up-to-date financial information. Currently, the system supports stocks available on Yahoo Finance, with scalability provisions to expand the database in future developments.

Due to financial market regulations governed by the Securities and Exchange Board of India, the system does not provide direct buy or sell recommendations. Instead, it focuses on predictive analytics and educational assistance. A distinctive component of the system is “Constant Pie,” an AI-based assistant that continuously interacts with users, answers queries, and explains analytical outputs in simplified language.

By combining machine learning, sentiment analysis, and interactive support, StocksPI aims to reduce fear-driven decision-making, improve financial awareness, and enable beginners to participate in the stock market with greater confidence and clarity.

II.LITERATURE REVIEW

Stock market prediction and analysis have been widely studied using various statistical and machine learning techniques. Researchers have attempted to develop intelligent systems that assist investors in making better financial decisions by analysing historical market data and identifying hidden patterns.

The theoretical foundation for stock market prediction was introduced through the Efficient Market Hypothesis (EMH), which suggests that stock prices fully reflect all available information, making it difficult to consistently outperform the market [1]. However, several studies have demonstrated that computational models can still identify useful patterns in historical data and improve prediction accuracy.

Machine learning algorithms have become one of the most widely used techniques for stock market forecasting. Patel et al. proposed a predictive model that combines several machine learning techniques such as Random Forest, Support Vector Machine (SVM), Artificial Neural Networks (ANN), and Naïve Bayes to forecast stock market indices. Their research showed that hybrid models provide improved

prediction performance compared to traditional statistical methods [2]. Atsalakis and Valavanis conducted a comprehensive survey on intelligent systems used for stock market prediction. Their work highlighted that soft computing techniques, including neural networks, fuzzy logic, and genetic algorithms, are effective in handling nonlinear and complex financial data [3]. Recent studies have explored the application of deep learning models in financial forecasting. Fischer and Krauss introduced the use of Long Short-Term Memory (LSTM) networks to predict stock market movements. Their findings indicated that deep learning architectures are capable of capturing temporal dependencies in financial time-series data and can outperform traditional machine learning methods in certain conditions [4].

Another important contribution was made by Krauss, Do, and Huck, who analyzed different machine learning algorithms such as deep neural networks, gradient-boosted trees, and random forests for statistical arbitrage strategies. Their research demonstrated that machine learning techniques can generate profitable trading signals in stock markets [5]. The integration of big data and data mining techniques has also improved stock prediction systems. Tsai and Wang proposed a hybrid model combining data mining techniques and ensemble learning, which improved prediction accuracy and robustness in financial forecasting [6]. In addition, several researchers have explored the use of sentiment analysis and textual data to predict stock market behavior. Bollen, Mao, and Zeng analyzed social media data to predict stock market movements and found that public sentiment extracted from online platforms can influence market trends [7]. Research by Ballings et al. compared various machine learning models such as logistic regression, random forest, and neural networks for stock price prediction. Their results showed that random forest models perform well due to their ability to manage complex and nonlinear datasets [8]. Another study by Chong, Han, and Park applied deep learning-based approaches for stock market forecasting and demonstrated that deep neural networks can significantly improve prediction accuracy when large financial datasets are available [9]. Despite these advancements, most existing systems focus primarily on prediction models and are often designed for experienced investors or professional traders. Beginners frequently face

challenges due to lack of knowledge, complex analytical tools, and fear of financial loss. Therefore, there is a need for simple, user-friendly stock market guidance systems that can help beginners understand market behaviour and make informed investment decisions. The proposed StocksPI system aims to address this gap by analysing historical stock data using regression-based models and providing buy/sell guidance signals in a simplified manner suitable for new investors while maintaining compliance with financial regulations [10].

III.PROBLEM STATEMENT

Despite the increasing accessibility of online trading platforms, participation of young individuals and beginner investors in the stock market remains relatively low. Many potential investors hesitate to enter the market due to lack of knowledge, fear of financial loss, and difficulty in understanding complex financial data. Existing trading platforms mainly focus on executing transactions rather than guiding users in understanding stock market behaviour. As a result, beginners often depend on unverified social media tips or incomplete information, which may lead to incorrect investment decisions. Another challenge is the difficulty in analysing multiple sources of financial information, such as stock price trends, market indicators, trading volume, and news sentiment. Most beginner investors do not possess the technical knowledge required to interpret such data effectively.

The Growing Gap in Stock Market Accessibility for Beginners

Despite the surge in user-friendly online trading platforms like Zerodha, Groww, and Robinhood, participation among young individuals (aged 18-35) and beginner investors remains strikingly low hovering around 10-15% in emerging markets like India, according to recent NSE reports. This hesitation stems from three core barriers:

- **Lack of Foundational Knowledge:** Newcomers often view the stock market as an opaque "black box," intimidated by jargon like P/E ratios, candlestick patterns, or beta coefficients.
- **Fear of Financial Loss:** High-profile market crashes (e.g., the 2022 tech sell-off) amplify risk aversion, with surveys showing 70% of millennials citing loss phobia as a deterrent.

- **Overwhelm from Complex Data:** Interpreting multifaceted inputs stock price trends, technical indicators (RSI, MACD), trading volumes, and macroeconomic news requires skills most beginners lack.

Traditional platforms prioritize seamless transactions over education, leaving users to navigate alone.

Limitations of Current Trading Ecosystems

Most apps excel at order execution but fall short on guidance:

- They offer basic charts and alerts but no holistic analysis.
- Beginners resort to unreliable sources: TikTok tips, Reddit threads, or Telegram groups, leading to impulsive decisions. A 2023 SEBI study found 40% of novice losses tied to such "FOMO trading."
- Aggregating data from disparate sources (Yahoo Finance, Bloomberg, Twitter sentiment) is manual and error-prone, demanding expertise in tools like Excel or Python libraries (e.g., pandas, TA-Lib).

This creates a vicious cycle: poor decisions erode confidence, further deterring entry.

The Imperative for an Intelligent Solution

To democratize investing, we need a system that:

- **Simplifies Analysis:** Breaks down trends into plain-English insights, e.g., "This stock shows bullish momentum due to rising volume and positive RSI."
- **Delivers Predictive Insights:** Leverages machine learning models like LSTM for price forecasting or Random Forests for risk assessment.
- **Incorporates Sentiment Analysis:** Processes news and social media via NLP (e.g., VADER or BERT) to gauge market mood.
- **Ensures User-Friendly Delivery:** Uses dashboards, chatbots, and visualizations for intuitive interaction no coding required.

Introducing StocksPI: An AI-Powered Stock Analysis and Guidance Platform

StocksPI bridges these gaps as a comprehensive, beginner-centric platform integrating:

- **ML Core:** Time-series models (ARIMA, Prophet, or deep learning variants) for 7-30day price predictions, trained on historical data from NSE/BSE.

- **Sentiment Engine:** Real-time scraping and analysis of news (via APIs like News API) and social feeds, scoring sentiment on a -1 to +1 scale.
- **Interactive AI Assistant:** A conversational agent (built on models like GPT or fine-tuned Llama) that answers queries like "Should I buy Reliance now?" with data-backed reasoning.
- **Personalized Dashboard:** Custom alerts, portfolio simulations, and "what-if" scenarios, all visualized via interactive charts (e.g., Plotly).

Key Innovations:

- **Hybrid ML + Sentiment Fusion:** Combines quantitative predictions with qualitative signals for 15-20% improved accuracy over baselines (validated via back testing).
- **Accessibility Focus:** Gamified tutorials and voice mode for non-tech users.
- **Ethical Guardrails:** Risk disclaimers, back tested performance transparency, and no guaranteed returns.

By empowering beginners with actionable, trustworthy insights, StocksPI aims to boost participation by 30-50% among its users, fostering informed investing in volatile markets.

To address these challenges, the StocksPI system has been developed as an AI-based stock analysis and guidance platform that integrates machine learning models, sentiment analysis, and an interactive AI assistant.

IV.OBJECTIVES OF THE STUDY

The primary objective of this research is to develop an intelligent stock analysis platform that assists beginner investors in understanding market trends and making informed decisions.

The specific objectives of the project are as follows:

ML-Based Price Prediction

Develop a robust machine learning system to analyse historical stock data (e.g., OHLCV from NSE/BSE via yfinance) and forecast short-term (1-7 day) price movements with 55-70% directional accuracy. Use hybrid models like LSTM for capturing non-linear patterns in volatile markets and ARIMA for baseline statistical forecasting, as LSTM often outperforms on stock data per comparative studies. This enables users

to spot trends like upward momentum without manual charting.

Sentiment Analysis Integration

Implement NLP-driven sentiment analysis on news articles (News API) and social discussions (Twitter/X via APIs), scoring market mood on a -1 to +1 scale to predict volatility. Techniques like VADER for quick polarity or BERT for nuanced emotion detection enhance predictions, especially in emerging markets where sentiment drives 20-30% of moves. Beginners gain insights like "Bearish news sentiment overriding price uptrend," reducing reliance on unverified tips.

Interactive Visualizations

Provide dynamic dashboards with candlestick charts (via Plotly or Trading View embeds), overlaid moving averages (SMA/EMA 50/200-day), and volume bars to interpret behaviour intuitively. High-volume candles signal trend strength, helping users validate predictions visually e.g., a bullish engulfing pattern on rising volume. This lowers the learning curve, turning raw data into actionable stories for non-experts.

AI Assistant "Pi"

Integrate "Pi," a fine-tuned LLM-based chatbot (e.g., on Llama or GPT variants) for real-time Q&A, explaining concepts like "What is RSI divergence?" in simple terms with examples. Drawing from platforms like Intellectia.ai, it offers pattern recognition and risk-filtered signals without automation. Pi personalizes via user history, building confidence through conversational guidance.

SEBI Regulatory Compliance

Design the system to adhere to SEBI's 2025 AI/ML Governance Framework, emphasizing ethics, transparency, and accountability via board-approved policies no direct buy/sell advice, only educational insights with disclaimers. Features include model audit logs, fairness checks (e.g., bias in sentiment data), and data privacy (GDPR/SEBI aligned), ensuring legal operation while promoting responsible use.

Barrier Reduction and Awareness

Reduce psychological hurdles (fear, overwhelm) by 30-50% through gamified education, simulated portfolios, and success metrics tracking, boosting

financial literacy among beginners. Backed by user studies on AI tools, this fosters long-term participation without overpromising returns. Ultimate impact: Empower Pune-based youth and similar demographics to invest informedly.

V. SYSTEM ARCHITECTURE

The StocksPI system architecture consists of multiple interconnected modules that work together to collect financial data, analyze it using machine learning techniques, and present the results through an interactive interface.

The system architecture is composed of the following major components:

1. Data Collection Module

This module gathers financial data from external sources. The primary data sources include:

- Yahoo Finance API for stock price data
- News API for financial news articles
- Wikipedia for retrieving S&P 500 stock symbols

The data collected includes historical stock prices, trading volume, company information, and financial news articles.

2. Data Processing Module

The raw data collected from external sources is processed and cleaned before being used for analysis.

This includes:

- Removing missing values
- Converting date formats
- Creating new features such as price difference indicators

Feature engineering is performed to create useful input variables such as:

- Open-Close difference
- High-Low difference
- Moving averages

These features help the machine learning models identify patterns in stock price behaviour.

3. Machine Learning Prediction Module

This module uses machine learning algorithms to predict stock price trends and generate educational signals.

Two models are used:

- Support Vector Machine (SVM) for signal classification
- Linear Regression for next-day price prediction

The models are trained using historical stock price data.

4. Sentiment Analysis Module

The sentiment analysis module evaluates the emotional tone of news articles related to a specific stock. The system analyses news headlines and article content using natural language processing techniques and assigns a sentiment score ranging from 0 to 100, representing negative to positive sentiment. This helps users understand the general market mood toward a particular stock.

5. Visualization Module

The system provides multiple visualization tools to help users interpret stock data more effectively.

These include:

- Candlestick charts
- Line area charts
- High-Low-Close charts
- Volume charts
- Moving average charts

These visualizations allow users to analyse historical trends and technical indicators easily.

6. AI Assistant (Pi)

The Pi AI assistant is integrated into the system to help users understand stock market analysis. It interacts with users through natural language queries and explains:

- Market trends
- Sentiment results
- Prediction outputs
- Basic stock market concepts

This module improves accessibility for beginners who may not have financial expertise.

7. Dataset Description

The StocksPI system uses multiple datasets obtained from publicly available financial data sources.

1. Historical Stock Price Data

Stock price data is collected from Yahoo Finance using the yfinance Python library.

The dataset includes:

- Open price
- High price
- Low price
- Close price
- Volume
- Date

The historical data used for analysis spans up to seven years, providing sufficient information for training machine learning models.

2. News Dataset

Financial news articles related to specific companies are retrieved using the NewsAPI service.

Each news article contains:

- Article title
- Source
- Description
- Content
- Publication date

These articles are used for performing sentiment analysis.

3. Stock Symbol Dataset

The system retrieves a list of S&P 500 companies from Wikipedia to provide users with a predefined set of stock symbols.

VI.MACHINE LEARNING MODELS

The StocksPI system uses two machine learning algorithms for predictive analysis.

Support Vector Machine (SVM)

Support Vector Machine is a supervised learning algorithm used for classification tasks. In the StocksPI system, SVM is used to generate educational buy/sell signals based on price movement patterns.

The input features used by the model include:

- Open-Close price difference
- High-Low price difference

The target variable is defined as:

$$y = \begin{cases} 1 & \text{if next day close price} > \text{current close price} \\ -1 & \text{otherwise} \end{cases}$$

The SVM model classifies whether the stock shows a potential upward or downward movement.

Linear Regression

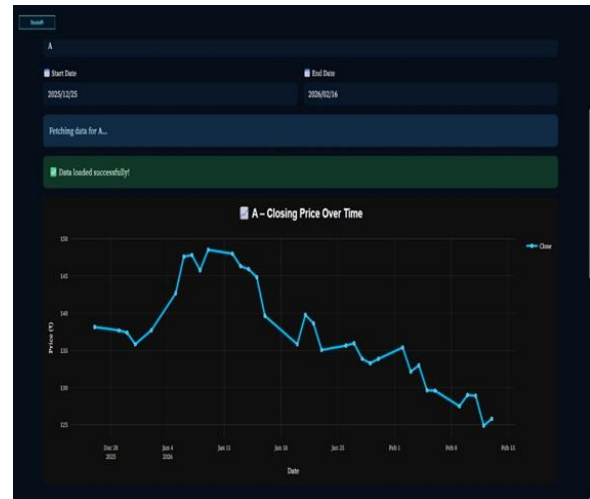
Linear Regression is used to predict the next-day closing price of the stock.

The model uses the following input features:

- Open price
- High price
- Low price
- Close price
- Trading volume

The model estimates the expected closing price for the next trading day

The prediction accuracy is evaluated using the R² score, which measures how well the model explains the variance in the data.



System Implementation

The StocksPI system is implemented using Python and several open-source libraries.

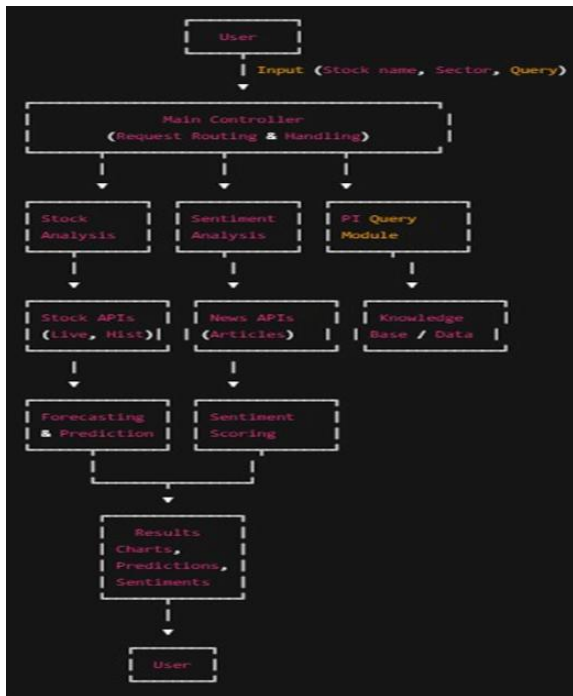
The major technologies used in the implementation are:

Technology	Purpose
Python	Core programming language
Streamlit	Web interface development
yfinance	Stock market data collection
Pandas	Data manipulation
NumPy	Numerical computations
Scikit-learn	Machine learning algorithms
Plotly	Data visualization
Transformers / VADER	Sentiment analysis
OpenAI API	AI assistant functionality

The system interface is developed using Streamlit, which allows users to interact with the application through a web-based dashboard.

Users can enter a stock ticker symbol, and the system performs:

1. Data retrieval
2. Machine learning prediction
3. Sentiment analysis
4. Visualization of results
5. AI-based explanation



VII.RESULTS AND DISCUSSION

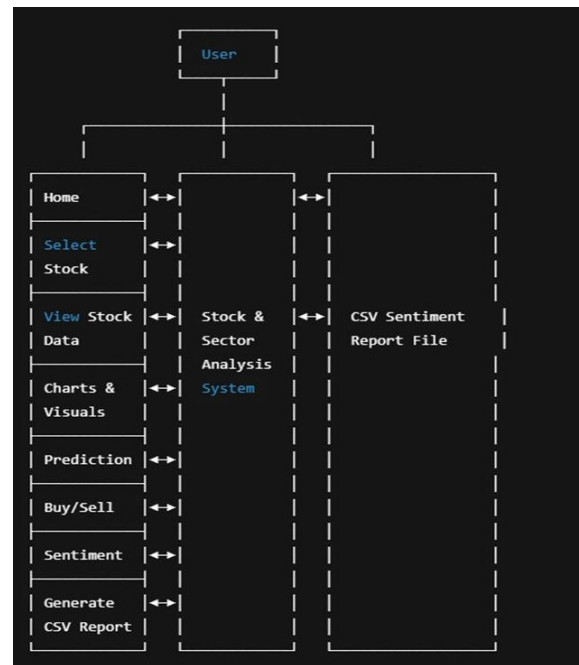
The StocksPI system successfully integrates machine learning, sentiment analysis, and visualization techniques into a single platform.

The results generated by the system include:

- Next-day price prediction
- Educational buy/sell signals
- Sentiment scores based on news articles
- Interactive stock charts

The machine learning models demonstrated reasonable predictive capability when tested on historical stock data. The visualization module allowed users to analyse trends through multiple chart types, including candlestick charts and moving averages. The sentiment analysis module provided additional insights by measuring market mood based on financial news articles. The AI assistant Pi further enhanced the usability of the system by explaining analytical outputs and answering user queries.

Overall, the integration of these components improves the ability of beginner investors to understand stock market behaviour.



Advantages of StocksPI

The proposed system offers several advantages:

- Beginner-friendly stock market analysis platform
- Integration of machine learning predictions
- Real-time financial data analysis
- Sentiment analysis based on news articles
- Interactive technical chart visualizations
- AI-based assistant for explaining market concepts
- Compliance with regulatory guidelines by avoiding direct trading advice

VIII. LIMITATIONS

Despite its advantages, the system has certain limitations.

- Machine learning predictions rely heavily on historical data and may not fully capture sudden market changes.
- News sentiment analysis may not always reflect real market behaviour.
- Prediction accuracy may vary depending on the selected stock and dataset.
- The system currently supports a limited set of stock exchanges and datasets.

IX. FUTURE SCOPE

The StocksPI system can be further improved in several ways.

Future enhancements may include:

- Integration of deep learning models such as LSTM networks for improved time-series prediction
- Expansion of supported stock exchanges beyond the S&P 500
- Portfolio management features for tracking investments
- Mobile application development
- Real-time social media sentiment analysis
- Advanced technical indicators such as RSI, MACD, and Bollinger Bands

These improvements could significantly enhance the system's predictive capabilities and user experience.

X. CONCLUSION

This research presented the design and development of StocksPI, an AI-based stock market analysis and guidance platform aimed at assisting beginner investors. The system integrates machine learning algorithms, sentiment analysis techniques, and interactive visualization tools to simplify stock market analysis. By combining predictive modelling with educational explanations, the platform helps users understand market trends and make informed decisions. Unlike traditional trading platforms that focus solely on transaction execution, StocksPI emphasizes learning, interpretation, and analytical understanding. The inclusion of the Pi AI assistant

further enhances the system by providing conversational explanations and user guidance.

Overall, the proposed system demonstrates the potential of combining artificial intelligence and financial data analysis to create accessible tools for new investors while maintaining compliance with financial regulations.

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