

TradeSense AI: Intelligent Portfolio Analysis and Trading Advisory System Using Technical and Sentiment Analysis

Prof. Renuka Arbat¹, Apurva Nagare², Anshul Deshmukh³, Niraj Madane⁴, Om Chaturkar⁵
^{1,2,3,4,5} *School of Computing, MIT ADT University, Loni Kalbhor, India*

Abstract—Trade Sense AI is an intelligent portfolio analysis and trading advisory system designed to simplify investment decision-making for retail investors. Financial markets generate large volumes of real-time and historical data, making it difficult for users to interpret technical indicators and market trends effectively. The system integrates real-time stock data, technical analysis, and AI-based sentiment analysis to generate actionable trading recommendations. The proposed solution improves decision-making efficiency and simplifies complex financial insights.

Index Terms—Artificial Intelligence, Stock Market, Sentiment Analysis, Technical Indicators, Portfolio Analysis

I. INTRODUCTION

The stock market is a highly dynamic and data-intensive domain that generates vast amounts of real-time and historical information. For retail investors, analyzing this data and making informed investment decisions is a complex and time-consuming task. Understanding technical indicators such as Relative Strength Index (RSI), Moving Average Convergence Divergence (MACD), Simple Moving Average (SMA), and Exponential Moving Average (EMA) requires domain expertise. Additionally, interpreting the impact of financial news and market sentiment further increases the complexity of decision-making. Existing investment platforms such as Zerodha and Groww provide tools for portfolio tracking and data visualization. However, these platforms primarily present raw data and charts without offering intelligent reasoning or actionable insights. As a result, users are required to manually analyze multiple sources of information, which makes the decision-making process inefficient and prone to errors. Recent advancements in artificial intelligence and Natural Language Processing (NLP) have enabled the

development of intelligent systems capable of analyzing both structured financial data and unstructured textual data such as news articles. Combining technical analysis with sentiment analysis has shown potential in improving the accuracy and reliability of market predictions.

To address these challenges, this paper proposes *TradeSense AI*, an intelligent portfolio analysis and trading advisory system that integrates real-time stock data, technical indicators, and AI-based sentiment analysis. The system generates clear BUY, SELL, or HOLD recommendations along with explanations, thereby simplifying complex financial data and assisting investors in making faster and more informed decisions.

II. LITERATURE REVIEW

Recent research in financial technology has explored the application of artificial intelligence and machine learning techniques for stock market prediction and analysis. Various studies have demonstrated that technical indicators such as Relative Strength Index (RSI) and Moving Average Convergence Divergence (MACD) are effective in identifying market trends and potential reversal points. These indicators are widely used in trading systems to support decision-making based on historical price patterns.

In addition to technical analysis, sentiment analysis has gained significant importance in recent years. Researchers have utilized Natural Language Processing (NLP) techniques to analyze financial news, social media, and market reports to determine investor sentiment. Studies indicate that positive or negative sentiment in financial news can significantly influence stock price movements. AI-based models have been developed to classify sentiment and incorporate it into trading strategies.

Several existing platforms and systems provide portfolio tracking and stock analysis features. Platforms like Zerodha and Groww offer visualization tools and basic analytics for investors. However, these systems primarily focus on presenting data rather than providing intelligent decision support.

Despite these advancements, most existing research and systems address either technical analysis or sentiment analysis independently. Very few approaches integrate real-time data, technical indicators, and AI-based sentiment analysis into a unified system. Furthermore, many solutions lack explainability and do not provide clear, actionable recommendations such as BUY, SELL, or HOLD decisions.

Therefore, there is a need for an integrated system that combines multiple analytical approaches and provides simplified, user-friendly insights. The proposed system aims to address these limitations by integrating technical and sentiment analysis with AI-driven reasoning to enhance investment decision-making.

III. PROPOSED SYSTEM

The proposed system, *TradeSense AI*, is an intelligent portfolio analysis and trading advisory platform designed to assist investors in making informed decisions. The system integrates real-time stock data, technical analysis, and AI-based sentiment analysis into a unified framework. It follows a full-stack architecture consisting of a frontend interface, backend processing unit, external data sources, and a database.

The overall workflow begins with user interaction through a web-based dashboard, where users can manage their portfolio and track stock performance. The frontend, developed using React and Tailwind CSS, communicates with the backend through RESTful APIs built using FastAPI. The backend handles data processing, analysis, and integration of multiple components.

Real-time and historical stock data are fetched using the Yahoo Finance (yFinance) API. This data is then processed to compute technical indicators such as Relative Strength Index (RSI), Moving Average Convergence Divergence (MACD), Simple Moving Average (SMA), and Exponential Moving Average (EMA). These indicators help in identifying market trends and potential trading signals.

In addition to technical analysis, the system incorporates sentiment analysis of financial news. Relevant news articles are collected using external APIs and analyzed using Natural Language Processing (NLP) techniques through the Google Gemini API. The sentiment of the news is classified as positive, negative, or neutral, which helps in understanding market behavior.

The outputs from technical analysis and sentiment analysis are combined in a recommendation engine that generates actionable trading decisions such as BUY, SELL, or HOLD. These recommendations are presented to the user through an interactive dashboard with charts and visualizations, making complex financial data easy to interpret.

The proposed system provides a comprehensive and intelligent solution compared to existing platforms like Zerodha and Groww, as it not only visualizes data but also offers AI-driven insights and decision support.

IV. METHODOLOGY

The proposed system follows an Agile development methodology, enabling iterative development, continuous testing, and incremental integration of system components. The methodology is divided into multiple stages, including data collection, data processing, technical analysis, sentiment analysis, and recommendation generation.

In the first stage, real-time and historical stock data are collected using the Yahoo Finance (yFinance) API. This data includes stock prices, volume, and historical trends, which form the basis for further analysis. Simultaneously, financial news related to selected stocks is fetched using external news APIs to capture market sentiment.

In the second stage, technical analysis is performed on the collected stock data. Key indicators such as Relative Strength Index (RSI), Moving Average Convergence Divergence (MACD), Simple Moving Average (SMA), and Exponential Moving Average (EMA) are computed. These indicators help in identifying trends, momentum, and potential buy or sell signals based on historical patterns.

The third stage involves sentiment analysis using Natural Language Processing (NLP) techniques. Financial news data is processed using the Google Gemini API to classify sentiment into positive, negative, or neutral categories. This step provides

insights into how external factors influence stock price movements.

In the final stage, the outputs of technical analysis and sentiment analysis are integrated into a recommendation engine. This engine applies predefined logic and AI-based reasoning to generate actionable trading decisions such as BUY, SELL, or HOLD. The results are then delivered to the user through a visual dashboard, ensuring clarity and ease of understanding.

V. IMPLEMENTATION

The TradeSense AI system is implemented as a full-stack web application integrating frontend, backend, database, and external APIs. The frontend is developed using React.js with TypeScript and styled using Tailwind CSS to provide a responsive and user-friendly interface. Data visualization is achieved using charting libraries such as Recharts and ApexCharts, enabling users to view stock trends and portfolio performance interactively.

The backend is developed using FastAPI, a high-performance Python framework for building RESTful APIs. It handles user authentication, data processing, and communication with external services. Secure authentication is implemented using JSON Web Tokens (JWT), and user passwords are stored using

hashing techniques such as bcrypt to ensure data security.

The system uses MongoDB Atlas as the database for storing user information and portfolio data. Asynchronous operations are managed using Beanie ODM and Motor, allowing efficient handling of real-time data requests.

For data collection, the Yahoo Finance (yFinance) API is used to fetch real-time stock prices and historical data. Financial news is retrieved using NewsAPI, and sentiment analysis is performed using the Google Gemini API. The backend processes this data to compute technical indicators such as RSI, MACD, SMA, and EMA.

The processed data is passed to the recommendation engine, which generates BUY, SELL, or HOLD decisions. These results are then displayed on the frontend dashboard, providing users with clear insights and actionable recommendations.

VI. RESULTS AND ANALYSIS

The developed TradeSense AI system was evaluated using real-time stock data and multiple test cases to assess its effectiveness in portfolio analysis and trading decision support. The system successfully integrates technical indicators and sentiment analysis to generate meaningful and actionable recommendations.

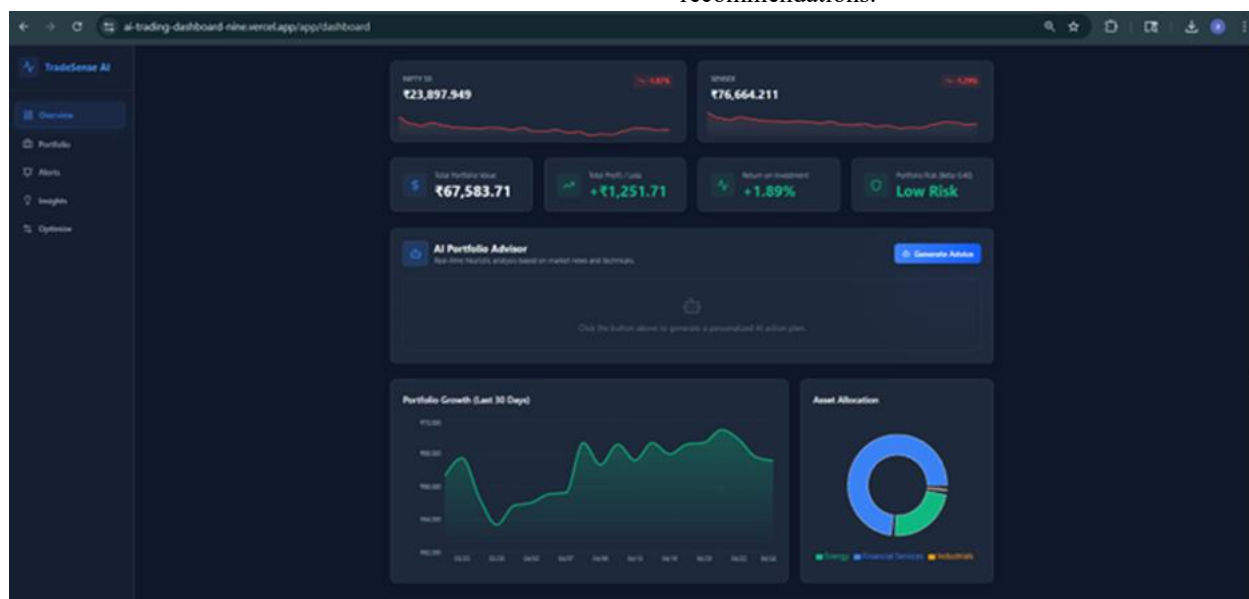


Fig. 1. TradeSense AI Dashboard Showing Portfolio Summary and Performance Metrics

The overall system dashboard, as shown in Fig. 1, provides a comprehensive view of portfolio performance, including total investment, profit/loss, and risk assessment. The visualization of financial metrics enables users to quickly understand their portfolio status without manual calculations.

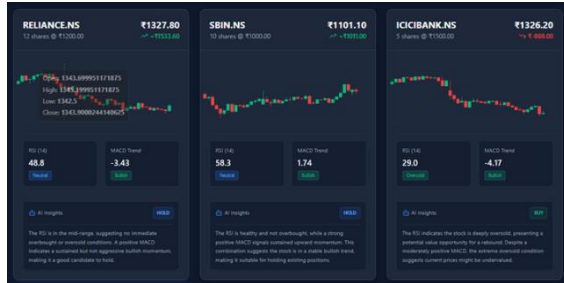


Fig. 1 Stock Analysis with Technical Indicators and AI-Based Trading Recommendations

Detailed stock-level analysis is presented in Fig. 2, where individual stocks are evaluated using technical indicators such as RSI and MACD. Based on these indicators and supporting data, the system generates AI-based recommendations such as BUY, SELL, or HOLD. The results demonstrate that the system effectively identifies potential trading opportunities and trends.

The sentiment analysis module further enhances decision-making by analyzing financial news and generating insights, as illustrated in Fig. 3. The system classifies market sentiment and provides explanatory insights, allowing users to understand the external factors influencing stock behavior.

Additionally, the portfolio optimization feature shown in Fig. 4 applies modern portfolio theory to suggest optimal asset allocation. The



Fig. 3 AI-Generated Market Insights Based on Sentiment Analysis

efficient frontier visualization and rebalancing suggestions help users improve returns while managing risk effectively.

Overall, the results indicate that the proposed system reduces the complexity of financial analysis, improves decision-making efficiency, and provides a user-friendly platform for intelligent trading advisory.

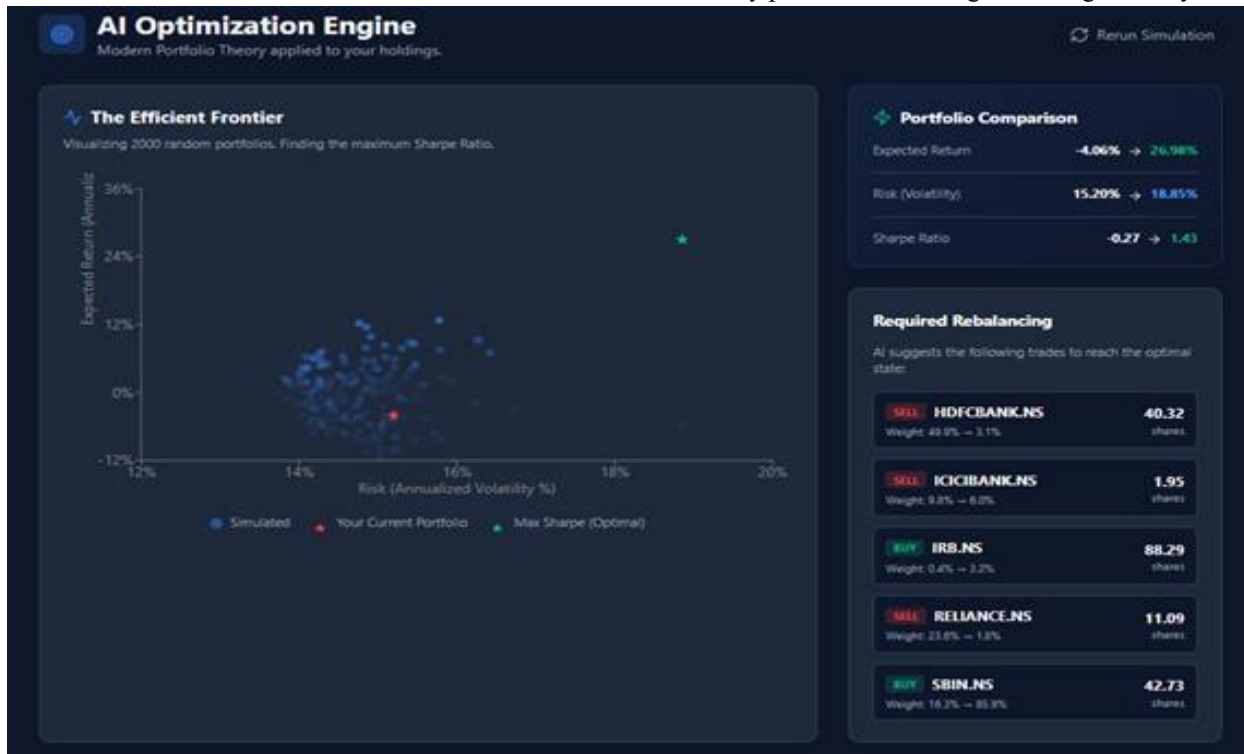


Figure 2. Portfolio Optimization Using Efficient Frontier and AI-Based Rebalancing

VII. DISCUSSION

The proposed TradeSense AI system demonstrates the effectiveness of integrating technical analysis and sentiment analysis for stock market decision support. By combining multiple data sources and analytical techniques, the system provides more comprehensive insights compared to traditional platforms. The inclusion of AI-generated recommendations reduces the need for manual interpretation and simplifies the decision-making process for users.

The system performs well in generating actionable insights based on real-time data and market sentiment. Features such as portfolio tracking, stock-level analysis, and optimization enhance the usability and practicality of the application. Compared to existing platforms like Zerodha and Groww, the proposed system offers additional intelligence by providing reasoning behind recommendations.

However, the system has certain limitations. The accuracy of recommendations depends on the quality of external data sources such as financial news and stock APIs. Additionally, the system currently relies on predefined logic and external AI services rather than fully trained custom machine learning models. Market volatility and unforeseen events may also affect prediction reliability.

VIII. CONCLUSION

This paper presented TradeSense AI, an intelligent portfolio analysis and trading advisory system that integrates real-time stock data, technical indicators, and AI-based sentiment analysis. The system successfully combines multiple analytical approaches to generate clear and actionable trading recommendations such as BUY, SELL, or HOLD.

The implementation of the system demonstrates its ability to simplify complex financial data and improve decision-making efficiency for retail investors. Through an interactive dashboard and AI-driven insights, users can easily interpret market trends and make informed investment choices.

Overall, the proposed system highlights the potential of artificial intelligence in financial technology and provides a scalable solution for intelligent investment advisory.

IX. FUTURE WORK

Future enhancements can further improve the capabilities and accuracy of the system. Integration with broker APIs such as Zerodha or Alpaca can enable direct trade execution. The addition of automated alerts and notifications can help users respond quickly to market changes.

Advanced machine learning models such as LSTM and deep learning techniques can be implemented for improved price prediction and trend analysis. A backtesting module can be introduced to evaluate the performance of trading strategies using historical data. The system can also be extended to support multiple asset classes such as cryptocurrencies, mutual funds, and ETFs. Developing a mobile application and training custom AI models for financial analysis are additional areas for future research and development.

REFERENCES

- [1] [1] Yahoo Finance API (yFinance), "Python Library for Financial Data," Available: <https://pypi.org/project/yfinance/>
- [2] [2] Google Gemini API, "AI Model Documentation," Available: <https://ai.google.dev/>
- [3] [3] NewsAPI, "News Data API Documentation," Available: <https://newsapi.org/>
- [4] [4] J. J. Murphy, *Technical Analysis of the Financial Markets*. New York: New York Institute of Finance, 1999.
- [5] [5] B. Liu, *Sentiment Analysis and Opinion Mining*. Morgan & Claypool Publishers, 2012.
- [6] [6] Investopedia, "Technical Indicators and Stock Market Concepts," Available: <https://www.investopedia.com/>
- [7] [7] Zerodha, "Online Trading Platform," Available: <https://zerodha.com/>
- [8] [8] Groww, "Investment Platform," Available: <https://groww.in/>
- [9] [9] FastAPI Documentation, Available: <https://fastapi.tiangolo.com/>
- [10] [10] React Documentation, Available: <https://react.dev/>
- [11] [11] MongoDB, "MongoDB Atlas Documentation," Available: <https://www.mongodb.com/>
- [12] [12] A. Patel et al., "Stock Market Prediction Using Machine Learning Techniques,"

International Journal of Computer Applications,
2020.