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Gan Based Framework Of Decision Support For Stock Market Forecasting

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Abstract- Stock market forecasting is a complex and challenging task due to the highly dynamic, nonlinear, and unpredictable nature of financial markets. Investors and traders continuously seek reliable tools that can help them make informed decisions while minimizing financial risk. Traditional statistical and machine learning approaches often struggle to capture sudden market fluctuations and hidden patterns present in stock price movements. To address these limitations, this paper presents a GAN-based framework for decision support in stock market forecasting. The proposed framework employs Generative Adversarial Networks (GANs) to learn complex market behavior from historical stock data and technical indicators. The generator network predicts future stock price movements, while the discriminator network evaluates the realism of these predictions by comparing them with actual market data. Through this adversarial learning process, the system improves forecasting accuracy and robustness. In addition to prediction, the framework provides decision support in the form of trend interpretation and buy–sell–hold signals, assisting users in practical investment decision-making. The proposed system aims to offer a reliable, intelligent, and data-driven solution for stock market forecasting.

Keyword- GANs,robustness,stock forecating,accuracy.

I. INTRODUCTION

The stock market is a key component of the global financial system, enabling capital investment and economic growth. Accurate prediction of stock price movements plays a vital role in helping investors manage risk and improve returns. However, stock markets are influenced by numerous factors such as economic indicators, political events, company performance, and investor sentiment, making forecasting a highly challenging problem.

Conventional forecasting techniques, including statistical models and traditional machine learning algorithms, are limited in their ability to model nonlinear relationships and rapidly changing market conditions. Although deep learning models such as LSTM and CNN have shown promising results in financial time series prediction, they primarily focus on minimizing prediction error and do not explicitly evaluate the realism of generated forecasts.

Generative Adversarial Networks (GANs) introduce a novel learning mechanism by training two competing neural networks simultaneously. This adversarial structure allows GANs to learn complex data distributions more effectively than conventional models. Motivated by these advantages, this paper proposes a GAN-based decision support framework that not only forecasts future stock prices but also assists investors by providing actionable insights. The objective is to enhance prediction reliability while supporting informed and confident investment decisions.

The main contributions of this paper are:

- Proposed a GAN-Based Stock Forecasting Framework
- Integration of Technical Indicators with Adversarial Learning
- Adversarial Training for Realistic Forecast Generation
- Development of a Decision Support Module
- Modular and Scalable System Architecture
- Performance Improvement over Baseline Models

II. RELATED WORKS

Stock market forecasting has been extensively studied using statistical, machine learning, and deep learning approaches due to its economic significance and inherent complexity. The unpredictable and nonlinear behavior of financial markets makes accurate forecasting a challenging research problem.

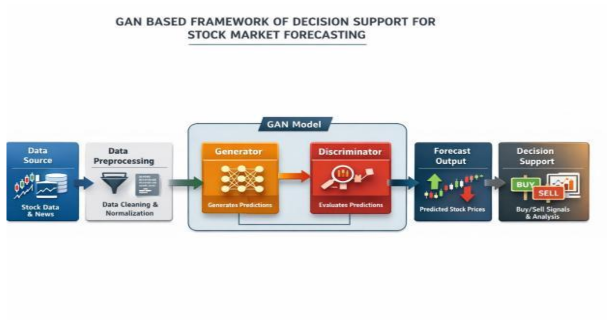
Early studies primarily relied on statistical techniques such as AutoRegressive Integrated Moving Average (ARIMA) and linear regression models. While these approaches are suitable for stationary and linear time-series data, they are limited in modeling nonlinear dependencies and abrupt market fluctuations.

With the advancement of machine learning, methods such as Support Vector Machines (SVM), Random Forests, and k-Nearest Neighbors were applied to stock prediction tasks. These models improved classification and regression performance compared to statistical approaches. However, their performance largely depends on manual feature engineering and predefined technical indicators.

Deep learning models further enhanced stock forecasting capabilities. Hochreiter and Schmidhuber [2] introduced the Long Short-Term Memory (LSTM) network, which effectively captures long-term temporal dependencies in sequential data. Fischer and Krauss [4] demonstrated that LSTM-based models outperform traditional machine learning techniques in financial market prediction. Similarly, deep neural network architectures have been employed to capture complex nonlinear patterns present in stock price movements.

Generative Adversarial Networks (GANs), proposed by Goodfellow et al. [1], introduced an adversarial learning mechanism that enables the modeling of complex data distributions. Although originally developed for image synthesis, GANs have recently been adapted for financial time-series applications. Guo et al. [3] explored GAN-based models for financial forecasting and showed that adversarial training improves the realism and diversity of generated stock price sequences. Variants such as Conditional GAN (CGAN) and Wasserstein GAN (WGAN) have been investigated to enhance training stability and forecasting performance.
Despite these developments, most existing GAN-based approaches focus primarily on data generation or prediction accuracy. There is limited research integrating adversarial forecasting with a structured decision support mechanism capable of translating predicted price movements into actionable investment signals.

III. ARCHITECTURE DESIGN



Proposed System

The proposed system is a GAN-based decision support framework designed to forecast stock market trends and assist investors in decision-making. The framework consists of four main components: data collection and preprocessing, feature extraction, GAN-based forecasting model, and decision support module.

Historical stock market data, including open, high, low, close prices and trading volume, are collected from reliable financial data sources. To enhance predictive performance, technical indicators such as moving averages, Relative Strength Index (RSI), MACD, and Bollinger Bands are computed. The data is then normalized and organized into time-series sequences suitable for model training.

The GAN model includes a generator network that forecasts future stock prices and a discriminator network that evaluates whether the generated forecasts resemble real market behavior. Through iterative adversarial training, both networks improve continuously, resulting in more accurate and realistic predictions. The decision support module analyzes the generated forecasts and provides clear investment signals such as buy, sell, or hold

IV. ALGORITHM

Input

- DDD: Historical stock
- market data (OHLC prices and volume)
- TTT: Computed technical indicators
- WWW: Time window size

Output

- PPP: Forecasted future stock prices
- SSS: Decision signals (Buy / Sell / Hold)

Step-by-Step Algorithm

Step 1: Data Acquisition
Collect historical stock market data DDD for the selected stocks over a defined time period.

Step 2: Data Preprocessing

- Clean the dataset by handling missing values and removing noise.
- Normalize the data using min-max normalization to scale all features into a uniform range.

Step 3: Feature Extraction

- Compute technical indicators TTT such as Moving Averages, RSI, MACD, and Bollinger Bands.
- Combine raw price data with technical indicators to form the final feature set.

Step 4: Time-Series Window Formation

- Segment the processed data into overlapping sequences using a fixed window size WWW to capture temporal dependencies.

Step 5: Initialize GAN Networks

Initialize the Generator network GGG and Discriminator network DDD with random weights.

Step 6: Discriminator Training

Feed real historical stock sequences to the discriminator.

- Generate synthetic future price sequences using the generator.
- Train the discriminator to distinguish between real and generated data.

Step 7: Generator Training

- Generate future stock price predictions using GGG.
- Pass generated samples to the discriminator.
- Update the generator parameters to minimize adversarial loss and fool the discriminator.

Step 8: Adversarial Learning Loop
Repeat Steps 6 and 7 for EEE epochs until convergence is achieved and equilibrium between GGG and DDD is reached.

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Step 9: Forecast Generation
  Use the trained generator network
to predict future stock prices PPP
for the desired forecasting horizon.

Step 10: Decision Support Generation
● Analyse forecasted prices to
  determine trend direction.
● Generate investment decision
  signals SSS such as Buy, Sell, or
  Hold based on predicted price
  movement.

End Algorithm
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V. CONCLUSION

This paper presented a GAN-based framework for decision support in stock market forecasting. By leveraging adversarial learning, the proposed system effectively models complex financial time series data and produces realistic and reliable forecasts. The inclusion of a decision support module enhances the practical value of the framework by assisting investors with actionable insights. The results demonstrate that GAN-based models hold significant potential for intelligent stock market forecasting and financial decision-making.

VI. REFERENCES

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