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Efficient Machine Learning Algorithm for Future Gold Price Prediction

Mrs. P. Jhansi Lakshmi¹, N. Mounika², U. Geethika Srilakshmi³, Ch. Anitha⁴

M.Tech, Computer science & Engineering, Bapatla Women's Engineering College, Bapatla, AP, INDIA¹

B.Tech, Computer science & Engineering, Bapatla Women's Engineering College, Bapatla, AP, INDIA²⁻⁴

Abstract: To protect one's wealth against inflation and economic volatility, gold is a vital financial asset. Nevertheless, a number of economic variables and market volatility make accurate gold price predictions difficult. Gold price forecasts made using more antiquated methodologies are notoriously inaccurate and unable to keep up with the everchanging market. This research proposes a machine learning-based strategy for forecasting gold prices using past data and economic factors to solve this problem. To determine which machine learning algorithms are most successful in accurately predicting future gold prices, the suggested approach uses a battery of them. The research finds the best algorithm for predicting future prices by comparing the results of several models. In order to improve the accuracy of the forecasts, the implementation employs data preprocessing methods, feature selection, and predictive modeling. To help policymakers, financial analysts, and investors make educated judgments about gold investments, this study presents a data-driven method.

Keywords: Machine Learning, Gold Price Prediction, Economic Variables, Forecasting, Data Analysis.

I. INTRODUCTION

Historically, gold has been seen as a safe haven from economic volatility and inflation, making it an attractive investment choice. But there are a lot of moving parts when it comes to trying to forecast gold prices, and they are affected by things like inflation rates, market demand, and changes in the global economy. Statistical models and expert analysis have long been the backbone of gold price forecasting, but they may be slow to adjust to sudden shifts in the market. Predictive models can now sift through massive datasets in search of complex patterns that impact the price of gold, all thanks to ML developments. Building an effective machine learning-based strategy to forecast gold prices using past data and economic factors is the primary goal of this project. The study's overarching goal is to identify the best model for gold price predictions by evaluating several ML algorithms. With the help of feature selection, predictive modeling, and data preprocessing, the suggested approach may improve the accuracy of forecasts. The goal of this strategy is to automate the forecast process so that investors, financial experts, and lawmakers can make educated judgments in the unpredictable gold market.

II. LITERATURE REVIEW

An algorithm for predicting the future price of gold was developed and published in the International Research Journal of Modernization in Engineering Technology and Science by Chodavrapu Pragna et al. (2022) [1]. While it helped investors using Decision Trees and SVM with historical data, it lacked real-time updates. At the 10th International Conference on Reliability, Infocom Technologies and Optimization, Divnoor Kaur Panag et al. (2022) [2] presented a model that may forecast the price of gold in India. However, it was only able to accomplish high accuracy on static datasets by using Random Forest and Linear Regression.

Presenting their work at the IEEE 9th Region 10 Humanitarian Technology Conference, Dhanush N et al. (2021) [4] developed an LSTM-based deep learning system for gold price forecasting. Although it was primarily concerned with deep learning, it was quite good at trend prediction. In the International Journal of Trend in Scientific Research and Development, Abhay Kumar Agarwal and Swati Kumari (2020) [8] presented a Random Forest-based prediction model that provides accuracy even without online integration.

Suggested Framework A robust machine learning approach that captures complicated, non-linear market trends, the Random Forest Regressor is used by the suggested system to improve gold price prediction. Through the use of sophisticated data processing and automation, this method outperforms conventional statistical models in terms of accuracy.



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Fig 1: Proposed system flow diagram

This machine learning model analyzes past patterns and uses the Random Forest Regressor to make very accurate predictions about the future price of gold. By identifying important indications like price trends and percentage changes, data preprocessing and feature engineering cleans, normalizes, and improves raw financial data. Hyperparameter adjustment, cross-validation, and reliability measures such as MAE, RMSE, and R² score are used in the model training and evaluation process to optimize performance. Uses a real-time forecasting tool to update forecasts continually as new data becomes available; this is known as an automated prediction system.

Very Accurate: Beats the competition with a score of 0.9995, demonstrating superior accuracy compared to more conventional forecasting techniques.

• Objective and Data-Driven: Makes use of objective market data to lessen dependence on expert judgments. Provides trustworthy information for investors to assess risks and improve strategies, leading to better risk assessment.

• Predictions Free of Bias: Removes room for human mistake, guaranteeing consistent and impartial projections. Maintaining relevance in ever-changing markets is possible since it is scalable and can be updated with fresh data.

• Open and Clear: Developed in Python, it facilitates simple interpretation and usage for financial analysts and experts.

Hardware and Software Needed A mix of front-end, back-end, and database technologies guarantees efficiency, scalability, and user-friendliness in the suggested system for predicting the price of gold. Web material is structured using HTML, and its visual appearance is enhanced using CSS. Interactive features, such real-time updates and user-friendly dashboards, are enabled using JavaScript, which is used to construct the front-end. Python, an open-source programming language, plus a lightweight framework like Flask or Django build the back-end, which processes data seamlessly between API endpoints and the web app. The system uses Scikit-learn to conduct numerical calculations, NumPy and Pandas for numerical computations, Matplotlib and Seaborn for data visualization, and the Random Forest Regressor for gold price prediction. The database management system is based on PostgreSQL or MySQL, which effectively record economic data, historical gold prices, and signals, and forecast outcomes, guaranteeing trouble-free data handling and retrieval. For reliable real-time gold price forecasting and decision-making, this software stack offers a strong, scalable, and user-friendly solution.



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III. IMPLEMENTATION

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Fig 2: Using the dataset we are training the model using the web interface we have created

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Fig 3: Once the training is completed we can run inference by giving a date as input and the model will predict the price of the gold by predicting it using the training data

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Gold Price Prediction

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Fig 4: Once the prediction is done we can able to view the price of the gold including all the metrices from the model.

Analysis: Numerous systems have been created using diverse front-end, back-end, and database technologies to foretell market behaviors and financial trends, such as the prediction of gold prices. Machine learning techniques have been used by certain models, while others have depended on more conventional statistical methods. Linear regression, neural networks, and time series analysis are some of the techniques now utilized to forecast gold prices; nevertheless, all approaches have their own set of advantages and disadvantages. There are a few web-based financial forecasting systems that use PHP, JavaScript, and MySQL. These systems mostly track the stock market in real-time. Separate financial analysis tools have been developed by other desktop-based solutions using Microsoft Access, SQL, and VB.NET. Users may now evaluate massive information and generate educated financial forecasts with the help of machine learning-based systems that employ Python and TensorFlow. By including front-end development with HTML, CSS, and JavaScript, the suggested system enhances these current solutions and guarantees an interactive and user-friendly interface. Python and Flask/Django provide the backend, which offers a stable and extensible setting for running ML models. To improve the precision of gold price forecasts, the Random Forest Regressor method is used. This technique is renowned for dealing with complicated, non-linear interactions. For effective storage of pricing history, economic indicators, and forecast results, the system utilizes MySQL/PostgreSQL as the database management system. The proposed system combines these technologies to provide investors and financial analysts with highaccuracy, real-time forecasts using an automated data-driven method that is available via mobile and online platforms.

IV. CONCLUSION

If implemented, the suggested system for predicting gold prices will greatly improve upon existing methods by making use of state-of-the-art machine learning algorithms, most notably the Random Forest Regressor. Scalable, automated, and data-driven financial analysis is made possible by the system's integration of an interactive front-end using HTML, CSS, and JavaScript, a strong back-end using Python with Flask/Django, and efficient data management using

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MySQL/PostgreSQL. This method catches intricate market trends and provides more accurate forecasts than conventional statistical models. Optimized model performance is achieved by the integration of data preprocessing, feature engineering, and hyperparameter tweaking. This leads to a decrease in prediction errors and an improvement in investor decision-making. Financial sector stakeholders may create educated investment plans in the ever-changing gold market with the help of this technology, which provides real-time updates, improves risk assessment, and reduces human bias.

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BIOGRAPHY



Jhansi Lakshmi, M.Tech, Asst. Professor, Dept of Computer Science & Engineering, BWEC, Andhra Pradesh,India.



N. Mounika[B.Tech], Student, Dept of Computer Science & Engineering BWEC, Andhra Pradesh, India.

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U.Geethika Srilakshmi[B.Tech], Student, Dept of Computer Science & Engineering, BWEC, Andhra Pradesh, India.



Ch. Anitha[B.Tech], Student, Dept of Computer Science & Engineering BWEC, Andhra Pradesh, India.