

Bangladesh Army University of Science and Technology (BAUST), Saidpur



Department of computer science and engineering

Title : Gold Price Prediction Using Machine and Deep Learning models

Course Title : Machine Learning Sessional

Couse code : CSE 4140

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Lecturers of CSE

Introduction

Gold is a globally valuable asset whose price changes frequently due to economic, political, and market factors. Predicting gold prices is challenging, so machine learning models are used to identify hidden patterns in historical data. This project applies ML and DL techniques to analyze past gold prices and generate accurate future price predictions.

Objective: To predict future gold prices.

Goal: To find the most accurate model and Gold investment safe.

Objectives

- To Predict future gold prices
- To Preprocess data and extract meaningful features for accurate prediction.
- To Compare model performance to identify the most reliable prediction method

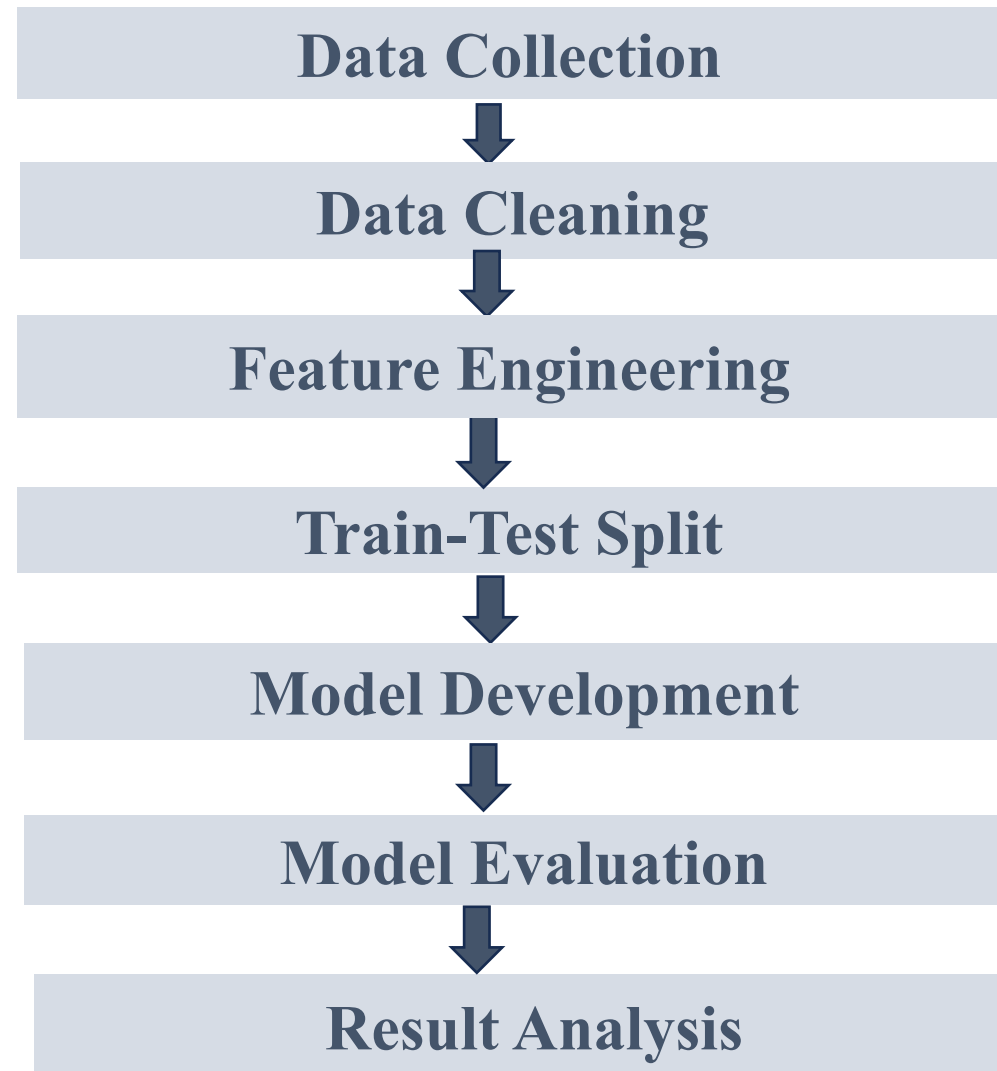
Related Work

Several studies have explored machine learning and deep learning techniques for gold price prediction. Different models, datasets, and methods were used.

TABLE I

Author / Year	Model Used	Dataset Source	Key Finding
Kumar & Patel, 2023	Hybrid LSTM + RF	Multi-source Data	Hybrid model improved trend prediction.
Sharma et al., 2021	Random Forest, LR	Yahoo Finance	RF outperformed LR in daily prediction.
Saha et al., 2022	LSTM, GRU	10-year Gold Price Data	LSTM captured long-term trends better.
Rahman & Hossain, 2020	XGBoost, Decision Tree	Kaggle Gold Dataset	XGBoost gave lower RMSE and higher stability.

Methology



Methodology

Data Collection : Historical gold price data was collected from financial databases, including Open, High, Low prices, Volume, and daily percentage changes.

Date	Price	Open	High	Low	Vol.	Change %	
#####	1,826.20	1,821.80	1,832.40	1,819.80	107.50K	0.01%	
#####	1,826.00	1,812.30	1,827.30	1,811.20	105.99K	0.56%	
#####	1,815.80	1,822.40	1,822.80	1,804.20	118.08K	-0.40%	
#####	1,823.10	1,808.20	1,841.90	1,808.00	159.62K	0.74%	
#####	1,809.70	1,805.80	1,811.95	1,805.55		0.30%	
#####	1,804.20	1,801.00	1,812.20	1,798.90	105.46K	0.50%	
#####	1,795.30	1,823.80	1,829.30	1,792.70	175.77K	-1.65%	
#####	1,825.40	1,827.90	1,833.80	1,821.30	110.18K	0.00%	
#####	1,825.40	1,796.80	1,832.40	1,793.70	197.50K	1.54%	
#####	1,797.70	1,801.60	1,808.60	1,793.20	86.09K	-0.14%	
#####	1,800.20	1,786.90	1,804.20	1,783.90	128.75K	0.69%	
#####	1,787.80	1,818.70	1,819.70	1,782.00	185.32K	-1.70%	
#####	1,818.70	1,822.60	1,825.40	1,806.20	143.80K	-0.37%	
#####	1,825.50	1,792.30	1,836.90	1,791.80	230.91K	1.85%	
#####	1,792.30	1,808.00	1,809.30	1,789.00	107.78K	-1.02%	
#####	1,810.70	1,801.90	1,819.00	1,800.10	150.94K	0.51%	
#####	1,801.50	1,798.50	1,805.00	1,793.20	115.27K	0.10%	

Gold Price (2013-2023)

+

Fig. 1:Dataset

Methodology

Data Cleaning:

- Removed commas from numeric values.
- Handled missing values.
- Converted all columns to numeric format

Feature Engineering :

- Extracted date-based features
- Created lag feature
- Applied scaling and sequence preparation

Train-Test Split :

- 80% Training data
- 20% Testing data

Model Development

Random Forest :

Random Forest predicts gold prices by training many decision trees on different subsets of the dataset.



Fig. 2: Random Forest Prediction Trend

Model Development

XGBoost :

It focuses more on difficult data points and optimizes errors using gradients. XGBoost highly accurate and stable for price forecasting.

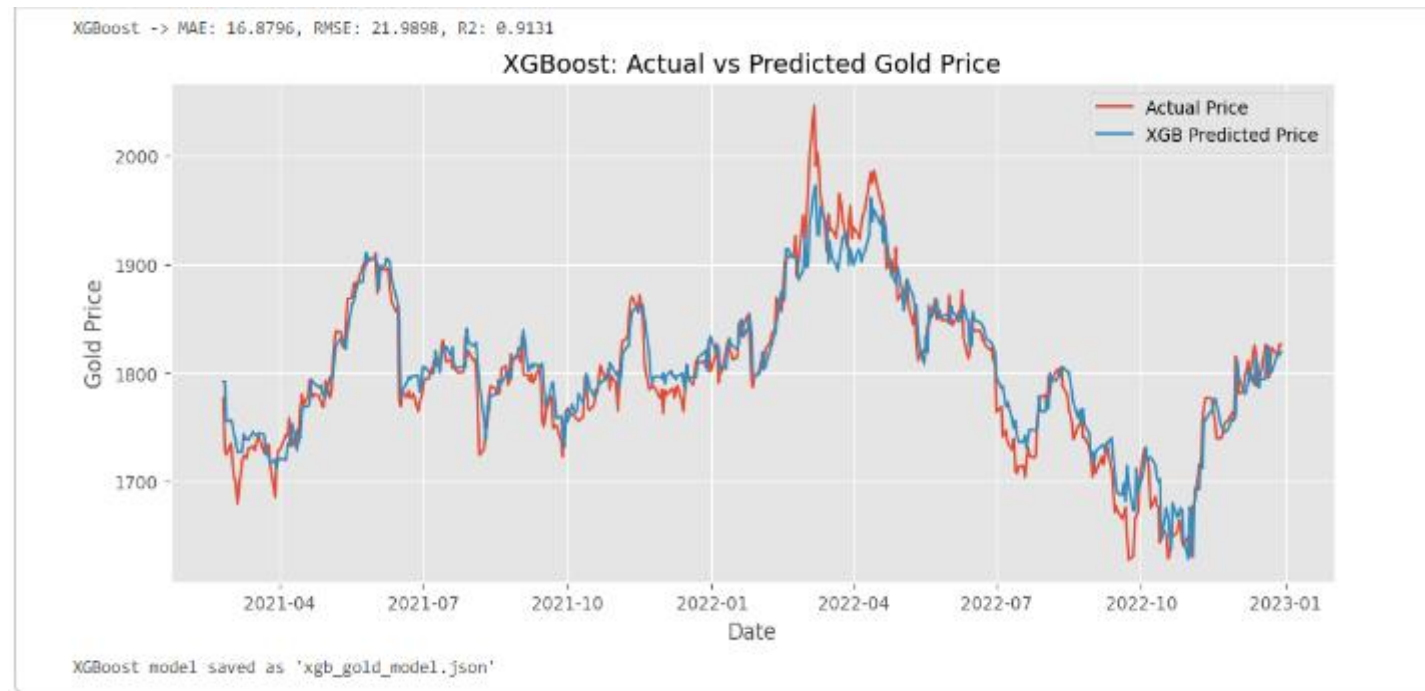


Fig. 3:XGBoost Prediction Trend

Model Development

LSTM :

LSTM predicts gold prices by processing sequential data using memory cells and gates that learn long-term dependencies.

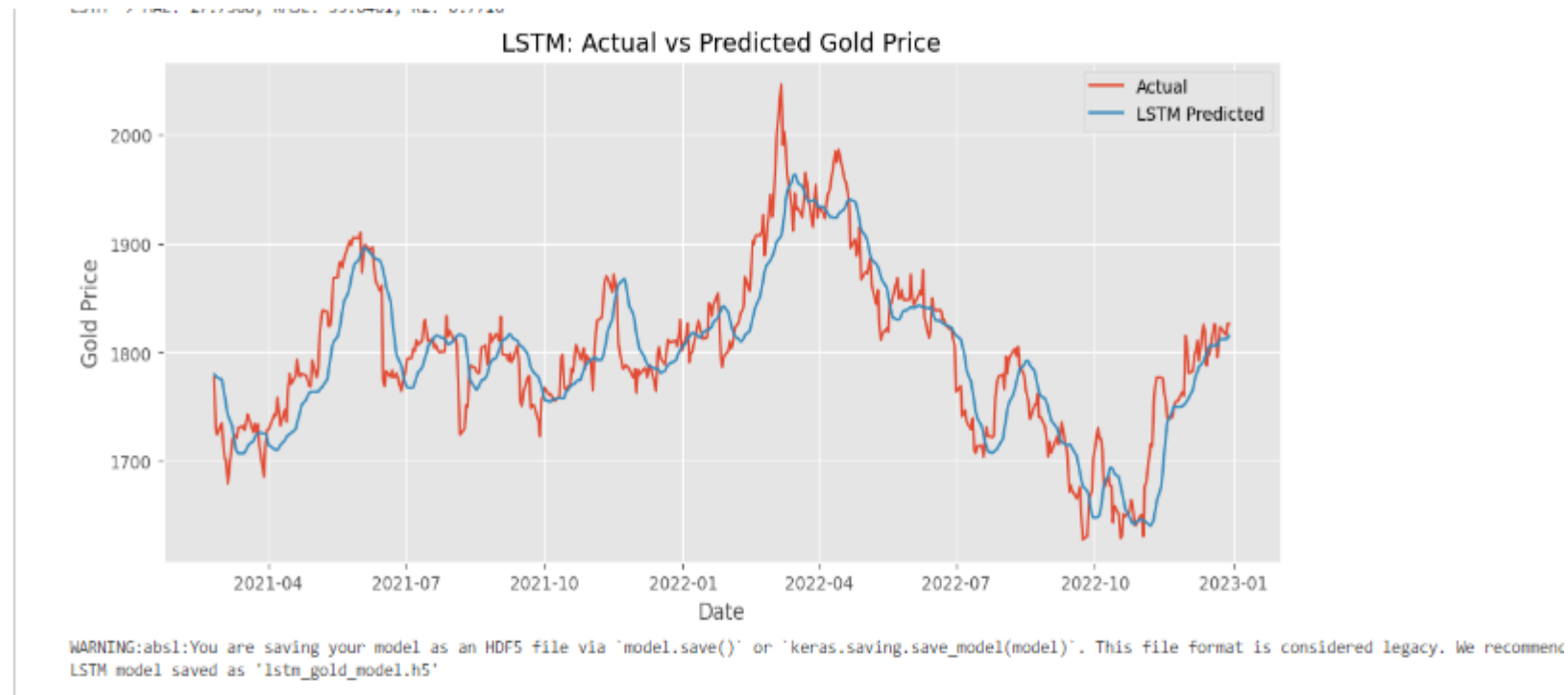


Fig. 4:LSTM Prediction Trend

Model Evaluation

ROC Curve: It how well my model can classify gold price trend (up/down) by comparing true positive rate vs. false positive rate across thresholds.

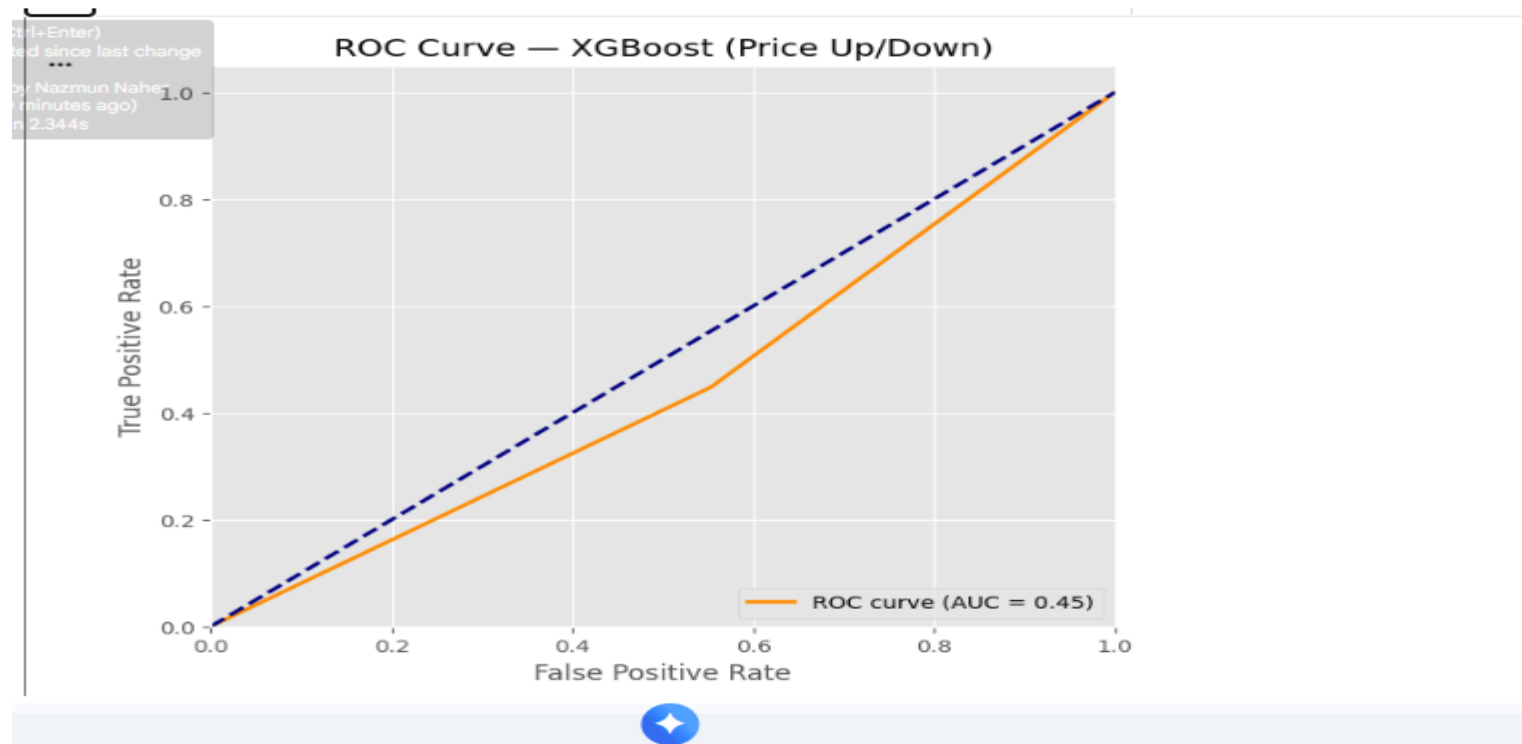


Fig. 5:ROC Curve for XGBoost Model

Result Analysis

TABLE II

Model	MAE	RMSE	R2	Accuracy %
Random Forest	22.36	30.71	0.83	83.03%
XGBoost	16.88	21.99	0.91	91.30%
LSTM	56/35	64.59	0.25	24.98%

The results clearly indicate that ****XGBoost**** significantly outperforms the other models

Future Research Scope

- ✓ Incorporation of Macro-Economic and Geo-Political Variables.
- ✓ Development of Hybrid and Ensemble Forecasting Architectures.
- ✓ Real-Time Adaptive Learning Using Streaming Data(API Based)

Conclusion

- The study concludes that XGBoost is the most effective model for gold price prediction in small to medium datasets.
- Feature engineering and data preprocessing helped improve model performance and reliability.
- Future improvements include adding more economic indicators and using hybrid deep learning models.

References

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