

# **GOLD PRICE PREDICTION USING MACHINE LEARNING**

**BY**

**SABBIR AHAMMED**

**ID: 181-15-11015**

**AND**

**KHALID IBN ALAM UTSOB**

**ID: 181-15-10713**

This Report Presented in Partial Fulfillment of the Requirements for the  
Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

**RUBAIYA HAFIZ**

Senior Lecturer

Department of CSE

Daffodil International University

Co-Supervised By

**ANIRUDDHA RAKSHIT**

Senior Lecturer

Department of CSE

Daffodil International University



**DAFFODIL INTERNATIONAL UNIVERSITY**

**DHAKA, BANGLADESH**

**JANUARY 2022**

## APPROVAL

This Project titled “GOLD PRICE PREDICTION USING MACHINE LEARNING”, submitted by Sabbir Ahammed (181-15-11015) and Khalid Ibn Alam Utsob (181-15-10713) to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 3<sup>th</sup> January 2021.

### BOARD OF EXAMINERS



**Chairman**

---

**Dr. S.M Aminul Haque**  
**Associate Professor and Associate Head**  
Department of Computer Science and Engineering  
Faculty of Science & Information Technology  
Daffodil International University



**Internal Examiner**

---

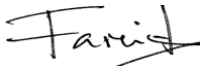
**Naznin Sultana**  
**Assistant Professor**  
Department of Computer Science and Engineering  
Faculty of Science & Information Technology  
Daffodil International University



**Internal Examiner**

---

**Raja Tariqul Hasan Tusher**  
**Senior Lecturer**  
Department of Computer Science and Engineering  
Faculty of Science & Information Technology  
Daffodil International University



**External Examiner**

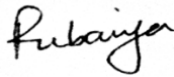
---

**Dr. Dewan Md. Farid**  
**Professor**  
Department of Computer Science and Engineering  
United International University

## DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Rubaiya Hafiz, Senior Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

### Supervised by:



---

**Rubaiya Hafiz**  
Senior Lecturer  
Department of CSE  
Daffodil International University

### Co-Supervised by:



---

**Aniruddha Rakshit**  
Senior Lecturer  
Department of CSE  
Daffodil International University

### Submitted by:



---

**Sabbir Ahammed**  
ID: 181-15-11015  
Department of CSE  
Daffodil International University



---

**Khalid Ibn Alam Utsob**  
ID: 181-15-10713  
Department of CSE  
Daffodil International University  
©Daffodil International University

## ACKNOWLEDGEMENT

First and foremost, we express our heartfelt gratitude to almighty God for His divine favor, which has enabled us to successfully finish the final year project/internship.

We really grateful and wish our profound our indebtedness to **Rubaiya Hafiz, Senior Lecturer**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of “*Machine Learning*” to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.

We would like to express our heartiest gratitude to Professor Dr. Touhid Bhuiyan, Professor and Head, Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of CSE department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents.

## **ABSTRACT**

Gold price prediction is very essential for investment in gold market. Gold is an important economical factor for a developing country like Bangladesh. It is a precious material and Bangladesh is a traditional country where everyone uses gold mainly for jewelry. So, the demand of gold is endless. Our people use to invest in gold because its price is continuously changing. So that it takes a strong position in our national economy. There are so many factors that influence gold price such as Global Gold Market, United States Currency Rate and Geopolitical Risks. We are facing a pandemic of Covid-19 which affected the gold market worldwide. US currency have been a major factor for gold rate movement for many years. In this research we have been used daily USD value in BDT and Silver price from January 2015 to September 2021 as two main factors for predicting gold price. In this work we tried to implement supervised machine learning algorithms such as Random Forest Regression, KNN, Decision Tree Classifier, Logistic Regression, and Multinomial NB to find out appropriate algorithm for our work. We have compared all these algorithms in our study. From this study, Random Forest Regression performed best among all other algorithms.

# TABLE OF CONTENTS

APPROVAL .....	ii
DECLARATION .....	iii
ACKNOWLEDGEMENT .....	iv
ABSTRACT.....	v
LIST OF FIGURES .....	viii
LIST OF TABLES .....	ix

## CHAPTER 1

<b>Introduction.....</b>	<b>1</b>
1.1 Introduction.....	1
1.2 Motivation.....	2
1.3 Rationale of the study .....	2
1.4 Research Questions .....	2
1.5 Expected Outcome .....	3
1.6 Report Layout .....	3

## CHAPTER 2

<b>LITERATURE REVIEW .....</b>	<b>5</b>
2.1 Introduction.....	5
2.2 Related Works.....	5
2.3 Comparative Analysis.....	7
2.4 Challenges.....	8

## CHAPTER 3

<b>RESEARCH METHODOLOGY .....</b>	<b>9</b>
3.1 Introduction.....	9
3.2 Data Collection .....	9
3.2.1 Analyze Correlation .....	10

3.3 Machine Learning Technologies.....	11
3.3.1 Supervised Learning .....	12
3.3.2 Regression.....	12
3.3.3 Random Forest Tree.....	12
3.3.4 Decision Tree .....	13
3.3.5 KNN.....	14
3.3.6 Multinomial Naïve Bayes .....	14
<b>CHAPTER 4</b>	
<b>EXPERIMENTAL RESULTS &amp; DISCUSSION.....</b>	<b>16</b>
4.1 Introduction.....	16
4.2 Experimental Result.....	16
4.3 Result & Discussion.....	17
<b>CHAPTER 5</b>	
<b>CONCLUSION &amp; FUTURE WORK.....</b>	<b>18</b>
5.1 Introduction.....	18
5.2 Future Plan .....	18
<b>REFERENCES.....</b>	<b>19</b>

## LIST OF FIGURES

Figure No.	Figure Name	Page No.
Figure 3.2.1.1	Processed Factors	10
Figure 3.2.1.2	Correlation of factors	10
Fig 3.3.3.1	Random Forest	12

**s**



## LIST OF TABLES

<b>Table No.</b>	<b>Table Name</b>	<b>Page No.</b>
Table 3.2.1	Data Source	9
Table 4.2.1	Results	15

# CHAPTER 1

## Introduction

### 1.1 Introduction

Gold Price Prediction is necessary for financial investment in gold market. Gold market holds a huge impact on national economics. A large number of people of Bangladesh connected with gold market. Although whole world facing financial crisis due to Covid-19, gold price stayed in a top point. Gold is a major economic driver and has both risks and profits in investing. So it's worth predicting gold price as it has very large impact on our country's mainstream finance.

Demand for gold, value of US currency, amount of gold in central bank reserve and some other factor drives gold price up and down. In this study, we used USD value in BDT and Silver price as factors for predicting gold price.

We have collected historical gold data from January 2015 to September 2021 in a daily basis. In 1<sup>st</sup> January of 2015 gold price in per vori BDT was 38,146 and in 30<sup>th</sup> September 2021 was 61,882. In this timeline, highest price was BDT 71,779 in August 2020 that was the time when Covid-19 hit the whole world and formed a global crisis. In that time, gold supply went to minimum and price increased rapidly. So it is clear that gold price is increasing by time. But it continues being up and down. So we can't predict gold price by thinking. There is a relationship between the price of gold and the US dollar, as the price of gold can affect when the value of the dollar goes up and down. Further relation will be shown in the working procedure of this research.

We have to use machine learning and data mining technologies to predict gold price. In this research we are going through various algorithms and those performs very well with this kind of data. Then we will compare their results with best outcomes from the models. We are using supervised machine learning methods like Random Forest Regression, Decision Tree, KNN, Logistic Regression, and Multinomial NB.

Random Forest Regression is a supervised learning approach for regression that use the ensembles learning method. Its accuracy made this model one of the most appropriate algorithm in this field of work.

Decision Tree is also a supervised learning algorithm it can be used for both regression and classification problems. By using Decision Tree, we create training model that can use to predict class or value of the target variable.

Like Decision Tree, KNN is also a supervised learning algorithm for solving both regression and classification problems. As per as our dataset is continuous, KNN is a fit for our work. The multinomial Naive Bayes classifier is suitable for classification with discrete features

## **1.2 Motivation**

In our daily life we are somehow connected to gold. It is recognized as a worldwide economic metric and will continue to play an important economically key role - both regionally and globally. We buy and sell gold frequently. Our national economy is also dependent on the rise and fall of gold price. A large number of people live by investing on gold market. Due to the volatility and fluctuation of gold prices, there has been an enormous increase in demand for efficient and accurate gold price prediction schemes. As a result, the establishment of a gold price prediction scheme is required to aid and support investors, merchants, and banking firms in making correct economic and monetary decisions. From this view of essence, we thought of research and implementing machine learning technologies in this area. We decided to collect historical gold data and implement different machine learning algorithms to bring up an appropriate model that can be used to build a website which can help people determine whether investing in gold for upcoming days will profitable or not. People can predict future gold prices in order to buy and sell gold at profitable levels while reducing risk.

### **1.3 Rationale of the Study**

If gold price is predicted, investors will be able to experience a risk-free investing in gold market. There will be minimum loss buying and selling gold materials. Country economy should be positively affected by stocking gold when the price tends to rise in a while.

### **1.4 Research Question**

From this section we will get to know questionnaires about our work.

1. How we will collect data for Bangladesh perspective?
2. What machine learning technologies should we use?
3. Whether our dataset will match with machine learning approach or not?

### **1.5 Expected Outcome**

We want to predict the gold price in a very good way using Silver & USD currency factor.

1. Using Correlation matrix, Find out the relationship within silver, currency and gold.
2. Implement different regression models in our dataset.
3. Compare the models by analyzing results.
4. Finally perceive the finest model among them.

### **1.6 Report Layout**

Five separate chapters are discussed in detail to make this research report more efficient and convenient for any viewers or researchers.

**Chapter 1** provides an important introduction to this research project. This is about gold price prediction and its brief information. This chapter explains the research motivation, the rationale for this study, the relevant research questions, the expected outcome, and the overall management information.

**Chapter 2** provides a detailed report on the study's background. Based on this research study, machine learning system, regression model, or other related works are described shortly.

**Chapter 3** This section provides detailed information about the methodology, proposed system, and system architecture for this research study. Algorithmic details for each used algorithm are described with mathematical inception.

**Chapter 4** provides a comprehensive result analysis for each step's outcome. It includes MAE, MSE, RMAE, R2 Value and Accuracy score.

**Chapter 5** provides discussion about the future scope and conclusion of the project.

## **CHAPTER 2**

### **Literature Review**

#### **2.1 Introduction**

Since gold is a necessary medium of economical exchange, many people researched in this field. Many paper and information has been published regarding research in this area. We have studied some of the papers. In this chapter we summarize their work and methodologies. In this chapter we also discuss about their research summery and challenges.

#### **2.2 Related Works**

Authors of [1] have used Time series method with for forecasting gold price. They studied that CPI is a driver for gold market. They have used United States consumer price index and Eurozone consumer price index along with Iran's consumer price index, Because the gold price has a tendency to move in relation to the USA currency and Eurozone currency.

In [2], the authors have used Support Vector Machine (SVM) technique to predict the gold price. They implemented SVR algorithm by using daily closing indices data from 1000 days and factors like Canada and South African exchange rate comparing to US Dollar value. From their conclusion, SVR has limitation on data set size and preferable for large data volume. They presented SVR efficiency compared to linear regression and neural networks.

The authors of [3] argue that the multiple linear regression (MLR) model is superior for predicting future gold prices. The MLR model is based on economic factors that influence the price of gold. During the forecast, the first model evaluated all potential independent variables, whereas the second model only considered a few (commodity Research Bureau Index, Euro/commodity exchange rate, and Treasury bill). Finally, the second model outperformed the first in terms of forecast accuracy.

In [4], authors used dataset consists of gold prices over the past five years on a monthly basis, Oil prices, Nifty Price, CPI, GDP, Dollar to Rupee rates. They have used Linear Regression Method. The model demonstrates that factors such as oil, the Nifty Index, the CPI (cost of living index), the USD to INR rate, the international gold price, and interest rates (Bank Rate) have a significant impact on the price of gold.

Authors of [5] used everyday data of 20 years to use appropriate econometric techniques to identify and extract additional information about the relationship between oil, gold, US dollar and stocks. Results indicate possibility of co-movement among them. But stock prices and gold prices appear to be more likely to move on their own, and oil prices and currency rates are more likely to be impacted by other factors.

The authors of [6], used Random Forest Method to forecast the gold prices fluctuating trend. To find out troublesome influence factor they used Stepwise Backward Variable selection, which generates innovative ideas for future research. From seven factor, only a group of factors DIJA and S&P500 had highest connectivity with gold price prediction and produced best accuracy.

By using ARIMA Model author of [7], wanted to predict ups and down of International gold price. But the author could not go well due to the limits of the ARIMA model and the absence of real data or factor. In this work AC, PAC, AIC, BIC also used to calculate accuracy.

As far as we see authors of [8], tried to find out rise and fall of gold price through geopolitical risk index factor. For that they applied random forest and logistic regression, SVM and Neural Network Techniques. We can't always measure geopolitical risks, pandemics, and how or how much its effect on gold price, so this factor sometimes becomes worst for predicting gold prices. The accuracy of those algorithm implemented on this work are quite disappointing.

In Covid-19 pandemic the world economy affected by many things and if we look into gold market, gold price broadly impacted. The authors of [9] tried to figure out the impact of

Covid-19 pandemic in gold price for that they used Long Short-Term Memory (LSTM) networks to predict future gold price.

By examining the pattern of previous prices of precious metals like gold and diamond, Authors of [10], applied regression models for future prediction aiming to get the most accurate result of all. Their best accuracy with Linear Regression Model is 0.88 while their best accuracy with Random Forest Regression Model is 0.99.

Hafezi and Akhavan in [11], used ANN to forecast gold price and compared to other published scientific paper and competitive models. They've built a differentiated table for main pros and cons of the major forecasting models. Their paper proposed a new forecasting model (BNN) and applied gold price prediction problem.

The volatility of gold prices is very important to avoid the risk of investing in gold. In [12], authors studied characterization of gold price movements and influencing events with data from the global gold price series data from January 1968 to June 2018. In this paper prediction using separate conditions is combined to predict the gold price using SVM and ANN, the combined prediction error becomes smaller.

Authors of [13] developed an LSTM model and trained their daily gold price data from 1979 to 2020. The output of the trained network shows that the predicted data closely follows the actual data.

### **2.3 Comparative Analysis**

Like other authors, in our paper we will also predict gold price. So the main question is on what basis we predict gold price. So let's figure out in this section. Two major things to predict gold price are factors and machine learning technologies.

If we analyze related works, we can see many types of factor are used. Consumer Price Index(CPI) of a country and also US & EURO CPI are also influences Gold Price because Gold price has a bonding with US & EURO Currency. We have used US currency as a factor. Moving to the next, International Gold



price, Oil Prices, Nifty prices, GDP, Inflation, Bank Interest Rate, Dow Jones Industrial Average (DJIA), Standard & Poor's 500 Index(S&P500), and Geopolitical Risk are most used factors for gold price prediction. We have a lot of factors to work but the problem is collection of real and continuous data is very tough for our country. There is not much available resource for these factors.

Data mining & Machine learning technologies have used for gold price prediction. Random Forest algorithm is best for gold price prediction because it's always gives us best accuracy. Logistic regression, Decision Tree, SVM, ARIMA, KNN, Artificial Neural Network, Ensemble models were used in related works. From those models we have chosen four to five models for our work.

## **2.4 Challenges**

The main difficulties were collecting historical gold & silver price and USD currency value in bdt on a daily basis. Then it was challenging to decide which models are suitable for our dataset to implement.

## CHAPTER 3

### Research Methodology

#### 3.1 Introduction

It is important to define the research approach in order to begin the research. We have gone through elaborating research work flow in this chapter. Then the used algorithms with equation, graph and tables were explained. The chapter concludes by clarifying our project's factual hypotheses and, in addition, providing a clear understanding of the execution needs.

This research has some stages in the workflow. They are data collection, analyze correlation between factors, model selection and implementation.

#### 3.2 Data Collection

We gathered information from the internet and processed it to build our own data collection. Data collection was so difficult, there isn't a single dataset accessible in this study. Here's the sources from where we collected our data.

Table 3.2.1: Data Source

Data	Source
Gold Price (BDT)	<a href="https://www.bullion-rates.com/">https://www.bullion-rates.com/</a>
Silver (BDT)	<a href="https://www.bullion-rates.com/">https://www.bullion-rates.com/</a>
USD value in BDT	<a href="https://www.investing.com/currencies/usd-bdt-historical-data">https://www.investing.com/currencies/usd-bdt-historical-data</a>

### 3.2.1 Analyze Correlation

The figure bellow describes the data count and other calculations of our data set,

	<b>SLV/Vori</b>	<b>USD to bdt</b>	<b>GLD/Vori</b>
<b>count</b>	2465.000000	2465.000000	2465.000000
<b>mean</b>	617.013115	82.012955	47537.210142
<b>std</b>	224.403183	2.753466	9730.404428
<b>min</b>	420.053498	68.650000	33019.000000
<b>25%</b>	522.168724	78.555000	40669.000000
<b>50%</b>	566.127572	83.400000	43999.000000
<b>75%</b>	621.596708	84.500000	54348.000000
<b>max</b>	5962.633745	85.600000	71779.000000

Figure 3.2.1.1: Processed Factors

Then we used correlation matrix to gather a result based on the relations between each factor columns.

Correlation is a measure of the relationship between two variables. A correlation matrix is formed by the set of correlation values between pairs of attributes in a dataset with multiple attributes.



Figure 3.2.1.2: Correlation of factors

From the correlation heat map, we see, relation between Silver and Currency is 0.30, Silver and Gold is 0.52, Gold and Currency is 0.75. Therefore, Gold and USD Currency is quite relevant. Here we come to know that gold price is influenced by USD value in BDT.

### 3.3 Machine Learning Technologies

There are variety of tasks that human beings are unable to do efficiently, in this need Artificial intelligence is used and a subset of artificial intelligence is machine learning. Machine learning allows software to become more adept at predicting outcomes without having to explicitly train them to do so. Machine learning algorithms use historical data to estimate new output values. In order to work with machine learning, there are four approaches and we used Supervised Learning approach because it's a part of our work.

### **3.3.1 Supervised Learning**

Supervised machine learning approaches utilize labeled samples of historical facts to create future predictions. Machine takes some of the data from dataset to train and keep the rest for test. We trained our 80% data and rest 20% used for testing. Following that, there are no restrictions on how much training the system may receive. When the learning algorithm compares its output to what was intended, it may detect flaws and update the model as necessary.

### **3.3.2 Regression**

In supervised learning we have Classification and Regression methods. We used regression in our work because we have two feature column (USD, Silver) and one label column (Gold), we have to predict a continuous quantity output of label column that is dependent on feature column (Independent variable). There are various techniques of regression and we used some appropriate ones.

### **3.3.3 Random Forest Regression**

Random forest model takes specific data from dataset and makes several decision trees. Aggregating every decision tree, it predicts on majority basis. That's why it is called Bootstrap Aggregation or Bagging. It works with row and feature sampling so that it gives less error rate than any other models.

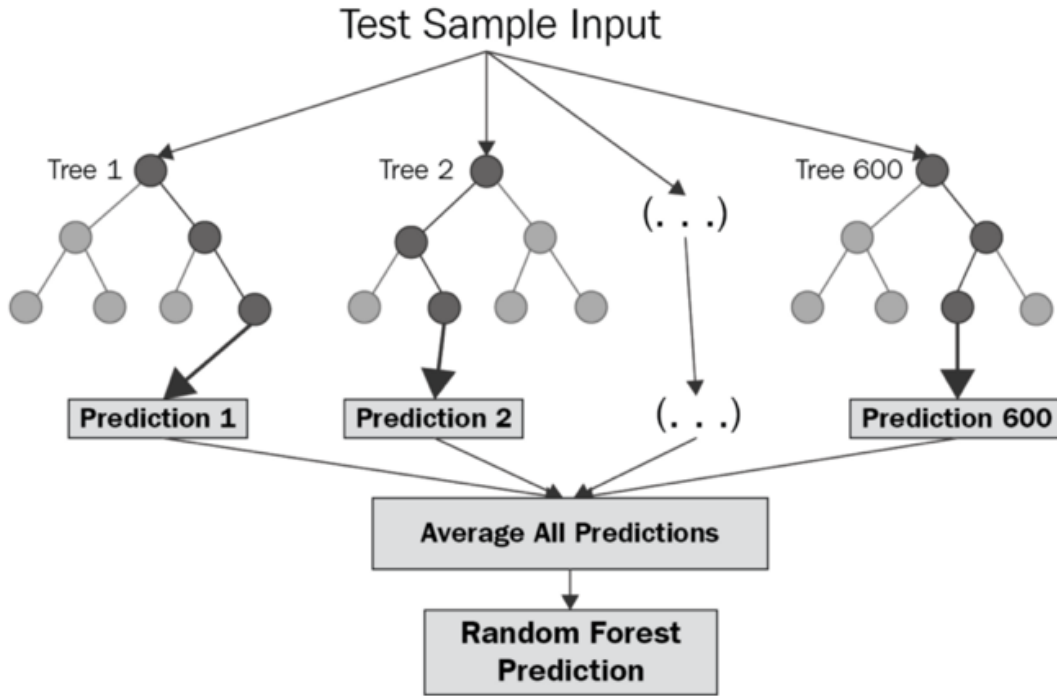


Fig 3.3.3.1: Random Forest

Figure 3.3.3.1 shows the structure of Random Forest Regression. The trees stay parallelly and have no contact between them.

### 3.3.4 Decision Tree

Two very different regression and classification problems can be tried to solve using decision tree. It gradually breaks down a dataset into tiny subsets even while constructing an associated decision tree. The end result is a tree with decision nodes and leaf nodes. Decision tree has two parts, Entropy and Gain and the goal is finding out gain. If we partition a dataset with respect to feature, the resulting ability to work is the Entropy.

$$\text{Entropy} = \sum_{l=1}^q \frac{p_l + q_l}{p+q} \times I(p_l, q_l) \dots \dots \dots (i)$$

The reduction in entropy is known as information gain, and it is frequently used in the training of decision trees which is measured by comparing the dataset's entropy before and after a transformation.

$$I.G = \frac{-P}{P+N} \log_2\left(\frac{p}{p+n}\right) - \frac{q}{p+n} \log_2\left(\frac{q}{p+q}\right) \dots\dots\dots(ii)$$

### 3.3.5 KNN Regression

In terms of conceptual simplicity, the K-nearest neighbors model is possibly the most commonly applied. KNN used for both classification and regression problems. Calculating the average of the numerical targets of the K nearest neighbors is a straightforward method of KNN regression. The same distance functions that can be used in KNN classification can also be used in KNN regression.

Euclidean Distance Formula:

$$d(x, y) = \sqrt{\sum_{i=1}^k (x_i - y_i)^2} \dots\dots\dots(i)$$

### 3.3.6 Multinomial Naïve Bayes

One of the most broadly used supervised machine learning classifiers for categorical text data analysis is Multinomial Naive Bayes. Through its mostly used for classification problem but it also used for regression. The Multinomial Naive Bayes algorithm is a deterministic learning approach used mostly in Natural Language Processing (NLP). The Bayes theorem lies at the foundation of the algorithm. The Equation is given below

$$P(A|B) = P(A) * P(B|A)/P(B) \dots\dots\dots(ii)$$

Here A is dependent variable and B is independent variable. Here we are calculating class A over the given class B.

$P(B)$  means prior probability of B

$P(A)$  means prior probability of class A

$P(B|A)$  means occurrence of predictor B given class A probability.



## CHAPTER 4

### Experimental Results & Discussion

#### 4.1 Introduction

The outcome is essential in any type of research and project. In this chapter, all of the results are presented in a table. We primarily used five models: Random Forest Regression, Decision Tree, KNN, Multinomial Naïve Bayes, and Logistic Regression each of which provides different outcomes.

#### 4.2 Experimental Results

Successfully implementing Machine Learning Models, each method displayed its unique scores, which were used to determine the best algorithm for gold price prediction. In Table 4.2.1 represents Model performance for the prediction.

Table 4.2.1: Results

No.	Algorithm	MAE	MSE	RMAE	R2Value	Accuracy
1	Random Forest	783.517	1988265.988	1410.059	0.979	0.996 (Train) 0.979 (Test)
2	Decision Tree	1111.414	5861191.653	2420.989	0.939	0.996 0.979
3	KNN	2342.282	16128877.418	4016.077	0.834	0.996 0.979
4	Logistic Regression	5387.868	50831949.178	7129.653	0.476	0.996 0.979
5	Multinomial Naïve Bayes	4531.949	36842827.901	6069.829	0.620	0.996 0.979

### **4.3 Result & Discussion**

From every algorithm we used, we got pretty similar accuracy results. In regression problems we consider Mean Absolute Error (MAE), Mean Squared Error (MSE), Relative Absolute Mean Error (RMAE) and R2 Values to determine perfect models for the application. In our case, R2 values of Logistic Regression and Multinomial NB are not good enough. Comparing MAE, MSE, RMAE values we came to a decision that states that, the Random Forest Model is most appropriate model for gold price prediction.

## **CHAPTER 5**

### **Conclusion and Future Work**

#### **5.1 Conclusion**

Machine Learning is a great subject for research in general. In our research we used some algorithms for Gold Price Prediction. In this era, it is such an essence for those who invests in gold market. We attempted to build a model that could predict the future gold price. The significant fact is that all of the data we gathered is accurate and comes from reliable sources. We tried to describe all of the working strategies, methodologies and models. We will conclude this research study by specifying that the Random Forest model is suitable for gold price prediction.

#### **5.2 Future plan**

For the future of this study we have planned to build up a web based application. People will simply jump in to the web and see predicted gold prices for upcoming days and gold price rise and fall will be shown in different panes. The user will also be able to see gold price for a particular date of past and predicted price for future dates. After building the website we will try to implement as a mobile application.

## REFERENCES

- [1] Hatamlou, A.R. and Deljavan, M., 2019. Forecasting gold price using data mining techniques by considering new factors. *Journal of AI and Data Mining*, 7(3), pp.411-420.
- [2] Ongsrirakul, P. and Soonthornphisaj, N., 2003, July. Apply decision tree and support vector regression to predict the gold price. In *Proceedings of the International Joint Conference on Neural Networks, 2003*. (Vol. 4, pp. 2488-2492). IEEE.
- [3] Ismail, Z., Yahya, A. and Shabri, A., 2009. Forecasting gold prices using multiple linear regression method. *American Journal of Applied Sciences*, 6(8), p.1509.
- [4] Sekar, K.R., Srinivasan, M., Ravidiandran, K.S. and Sethuraman, J., 2017, July. Gold price estimation using a multi variable model. In *2017 International Conference on Networks & Advances in Computational Technologies (NetACT)* (pp. 364-369). IEEE.
- [5] Samanta, S.K. and Zadeh, A.H., 2012. Co-movements of oil, gold, the US dollar, and stocks.
- [6] Liu, D., & Li, Z. (2017). Gold price forecasting and related influence factors analysis based on random forest. In *Proceedings of the Tenth International Conference on Management Science and Engineering Management* (pp. 711-723). Springer, Singapore.
- [7] Yang, X., 2018. The Prediction of Gold Price Using ARIMA Model. *Advances in Social Science, Education and Humanities Research*, 196(2), pp.273-276.
- [8] Banerjee, D., Ghosal, A. and Mukherjee, I., 2019. Prediction of gold price movement using geopolitical risk as a factor. In *Emerging Technologies in Data Mining and Information Security* (pp. 879-886). Springer, Singapore.
- [9] Hansun, S., & Suryadibrata, A. (2021). Gold Price Prediction in COVID-19 Era. *Journal of Computational Intelligence in Control* 12, 2, 1-4.s
- [10] Pandey, A.C., Misra, S. and Saxena, M., 2019, August. Gold and diamond price prediction using enhanced ensemble learning. In *2019 Twelfth International Conference on Contemporary Computing (IC3)* (pp. 1-4). IEEE.
- [11] Hafezi, R. and Akhavan, A., 2018. Forecasting gold price changes: Application of an equipped artificial neural network. *AUT Journal of Modeling and Simulation*, 50(1), pp.71-82.

[12] Wen, F., Yang, X., Gong, X. and Lai, K.K., 2017. Multi-scale volatility feature analysis and prediction of gold price. *International Journal of Information Technology & Decision Making*, 16(01), pp.205-223.

[13] Vidya, G.S. and Hari, V.S., 2020, December. Gold Price Prediction and Modelling using Deep Learning Techniques. In 2020 IEEE Recent Advances in Intelligent Computational Systems (RAICS) (pp. 28-31). IEEE.

## Turnitin Originality Report

Processed on: 30-Dec-2021 23:53 +06

ID: 1736507811

Word Count: 4434

Submitted: 1

**GOLD PRICE PREDICTION USING MACHINE  
LEARNING** By Sabbir Ahammed

Similarity Index

25%

### Similarity by Source

Internet Sources: N/A  
Publications: N/A  
Student Papers: 25%

5% match (student papers from 14-Jan-2021)

[Submitted to Daffodil International University on 2021-01-14](#)

2% match (student papers from 04-Apr-2018)

[Submitted to Daffodil International University on 2018-04-04](#)

1% match (student papers from 17-Jan-2021)

[Submitted to Daffodil International University on 2021-01-17](#)

1% match (student papers from 31-Mar-2018)

[Submitted to Daffodil International University on 2018-03-31](#)

1% match (student papers from 20-Nov-2021)

[Submitted to Intercollege on 2021-11-20](#)

1% match (student papers from 14-Apr-2020)

[Submitted to University of Wales, Bangor on 2020-04-14](#)

1% match (student papers from 26-Apr-2020)

[Submitted to University of Newcastle upon Tyne on 2020-04-26](#)

1% match (student papers from 13-Sep-2020)

[Submitted to University College London on 2020-09-13](#)

1% match (student papers from 07-Oct-2020)

[Submitted to University of Southampton on 2020-10-07](#)

1% match (student papers from 20-Nov-2021) <a href="#">Submitted to Ahlia University on 2021-11-20</a>
1% match (student papers from 12-Aug-2020) <a href="#">Submitted to University of Hong Kong on 2020-08-12</a>
1% match (student papers from 29-Sep-2021) <a href="#">Submitted to University of Leicester on 2021-09-29</a>
1% match (student papers from 03-Apr-2020) <a href="#">Submitted to California Institute of Advanced Management on 2020-04-03</a>
1% match (student papers from 22-Oct-2021) <a href="#">Submitted to University of Sydney on 2021-10-22</a>
1% match (student papers from 19-Jan-2015) <a href="#">Submitted to CITY College, Affiliated Institute of the University of Sheffield on 2015-01-19</a>
1% match (student papers from 16-Dec-2021) <a href="#">Submitted to National College of Ireland on 2021-12-16</a>
< 1% match (student papers from 29-May-2021) <a href="#">Submitted to Daffodil International University on 2021-05-29</a>
< 1% match (student papers from 28-Mar-2018) <a href="#">Submitted to Daffodil International University on 2018-03-28</a>
< 1% match (student papers from 24-Nov-2018) <a href="#">Submitted to Daffodil International University on 2018-11-24</a>
< 1% match (student papers from 30-Apr-2020) <a href="#">Submitted to University of Wales, Bangor on 2020-04-30</a>
< 1% match (student papers from 12-Sep-2021) <a href="#">Submitted to University College London on 2021-09-12</a>
< 1% match (student papers from 21-May-2020) <a href="#">Submitted to University of Southampton on 2020-05-21</a>
< 1% match (student papers from 21-Oct-2021) <a href="#">Submitted to University of Technology, Sydney on 2021-10-21</a>

< 1% match (student papers from 30-Nov-2021) <a href="#">Submitted to South Bank University on 2021-11-30</a>
< 1% match (student papers from 03-Jun-2021) <a href="#">Submitted to University of Wales Institute, Cardiff on 2021-06-03</a>
< 1% match (student papers from 11-May-2020) <a href="#">Submitted to The University of Fiji on 2020-05-11</a>
< 1% match (student papers from 07-Jul-2018) <a href="#">Submitted to Universiti Teknologi MARA on 2018-07-07</a>
< 1% match (student papers from 15-Aug-2021) <a href="#">Submitted to Rivier University on 2021-08-15</a>
< 1% match (student papers from 05-Nov-2021) <a href="#">Submitted to Rochester Institute of Technology on 2021-11-05</a>
< 1% match (student papers from 15-Sep-2016) <a href="#">Submitted to University of Liverpool on 2016-09-15</a>
< 1% match (student papers from 02-Aug-2021) <a href="#">Submitted to Nepal College of Information Technology on 2021-08-02</a>
< 1% match (student papers from 01-Jun-2013) <a href="#">Submitted to Higher Education Commission Pakistan on 2013-06-01</a>
< 1% match (student papers from 29-Aug-2012) <a href="#">Submitted to University of Edinburgh on 2012-08-29</a>
< 1% match (student papers from 17-Jul-2020) <a href="#">Submitted to Colorado State University, Global Campus on 2020-07-17</a>
< 1% match (student papers from 17-Apr-2020) <a href="#">Submitted to Coventry University on 2020-04-17</a>
< 1% match (student papers from 25-May-2020) <a href="#">Submitted to Southern New Hampshire University - Continuing Education on 2020-05-25</a>
GOLD PRICE PREDICTION USING MACHINE LEARNING BY SABBIR AHAMMED <a href="#">ID: 181-15-11015</a> AND KHALID IBN ALAM UTSOB <a href="#">ID: 181-15-10713</a> <a href="#">This Report Presented in Partial Fulfillment of the</a>