

Prognosis on Analyzing Currency Exchange Rates through Decision Node Regression using Machine Learning

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Abstract:- The project titled "Currency Exchange Rate Prediction" is the regression problem in Machine Learning. In the financial market, Current Exchange is playing the biggest part and expanding its wings day by day by the concept of Globalization. If you look into the current US Dollar which speaks 81.40 in Indian rupees. [fig:1]. Here the value of one US dollar is different from country to country. There are many factors which affect the exchange rates of currency like psychological aspects, political and economic etc. [Fig:3]. The problem of Currency Exchange prediction is difficult to deal with. Through this project, our team is going to solve the problem of currency exchange with Machine learning technology using python. Predicting the currency rate gives the investor an added edge in making their investment in a better method because the forex market is the foundation of worldwide investing and international trade. It's crucial to accurately calculate the forex rate so that we don't give people incorrect information. EMD-RNN and ARIMA are two models that we are utilizing to make an accurate prediction. To demonstrate which is superior, compare their output with the same data set. The historical dataset obtained through foreign exchange is used to test the aforementioned strategies. Predicting currency exchange rate predictions need to look into all the changes and consider them daily globally. [Fig:3]. These predictions affect the income of every citizen of a person and show impacts on businesses as well as on a country's economy. Thus, with the currency exchange rate prediction we can help every individual as well as country in many ways. The future currency exchange predictions are derived by studying all possibilities of historical data in the FOREX Market. There are four Machine Learning models which support currency exchange predictions. They are Backpropagation, Radial Basis Function, Long Short-term Memory, Support Vector Regression.

Keywords: Currency Exchange Rate Prediction, ARIMA, FOREX Marketing, Regression, Supervised Machine Learning, Decision Node Regression Algorithm, CART.

I. INTRODUCTION

As we know so far Currency Exchange highlighted as one of the most popular financial markets. If we compare the current scenario 1 US dollar is equivalent to the 81.40 INR in India [Fig:1]. Currency Exchange concerns on many factors such as economic, psychological and political factors. This currency exchange is not a simple problem to predict the rates ahead. However, through this project we walk you through the achievement of this task using the trending Technology Machine Learning using Python. Currency Exchange Rate Prediction is considered to be a Regression Problem in Machine Learning Technology. These exchange rates decide everything that might affect the financial conditions of every individual in a Country. So, the benefit of predicting currency exchange values is helpful to individuals as well as Country in countless ways. Machine Learning offers numerous algorithms to confront the Currency Exchange predictions. In our project we're dealing the same problem of currency exchange using Decision Tree Regression algorithm. Initially, our step to deal with this project must be collecting the appropriate datasets. All the above declared models were designed using python programming language and trained as well as tested to know the strengths and weaknesses of each of them. Currency exchange rate prediction is needed by traders and investors. As economics, imports, exports grow excessively. People will certainly exchange their currency based on their requirements to get profits. For this they will refer to the Currency Exchange rate predictions. As the country's economy is highly dependent on their currency value in the global market, every second it concerns the country. With these an investor might get a chance to make cognitive decisions from not confronting the risks. Forex markets are staying active in producing the daily data of marketing movements. Through this machine adapted to automate themselves according to the marketing movements and affects the currency exchange. These continuous changes will remind and notify the investors from time to time.

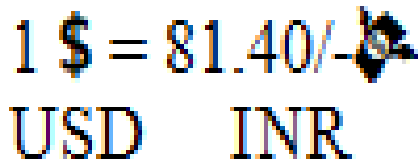


Fig 1 Currency Exchange Rate

➤ *Technologies Used:*

• *Python:*

Python is a robust programming language that has grown in popularity in recent years due to its simplicity, readability, and adaptability. Because it is an interpreted language, which means that it does not need to be compiled before executing, it is simple to use and debug. Python has a wide range of third-party libraries and frameworks, which is one of its most distinctive qualities. This makes it a popular choice for a variety of applications, from web development and data analysis to machine learning and artificial intelligence. Python is an excellent programming language for both newcomers and seasoned programmers alike because of its simple syntax. Python has a sizable and helpful community as well, which aids in the language's ongoing expansion and improvement. Python is unquestionably a language to take into consideration whether you are just getting started in programming or searching for a flexible language for your upcoming project.

• *Numpy:*

For activities involving numerical computing and data analysis, data scientists, statisticians, and academics frequently employ the well-known Python package NumPy. It offers tools for integrating C, C++, and Fortran code as well as robust array processing and linear algebra capabilities. The efficient, multi-dimensional data structures known as NumPy arrays make it simple and quick to manipulate arrays, matrices, and tensors. NumPy has developed into a complete library containing a variety of utilities, including mathematical functions, statistical analysis, and random number generation, despite being initially known as "Numeric Python." NumPy is a vital tool for scientific computing and data analysis using Python because of its dependable performance and comprehensive functionality.

• *Matplotlib:*

Due to its simplicity of use and rigidity, Matplotlib has come a well-known data visualisation toolkit for the Python programming language. It's an open-source library that's constantly employed in a variety of diligence, including wisdom, commerce, engineering, and finance, to produce high-quality plots and maps. Matplotlib's rigidity is one of its crucial benefits. It provides a variety of conniving options, including line graphs, smatter plots, bar plots, histogram plots, and heat charts, that can be used to produce colourful visualisations. As a result, it's an effective tool for data disquisition and donation. also, Matplotlib enables the customization of plots through a range of settings, including modifying the axis names, ticks, and line colours and styles,

as well as adding reflections and textbook. also, it enables the development of multitudinous plots within a single figure, making it easier to compare and assay colourful information. Working seamlessly with other Python libraries like NumPy, Pandas, and SciPy is another emotional particularity of Matplotlib. This enables the structure of complex visualisations that combine multitudinous types of data and the simple integration of data from different sources. also, a sizable and vibrant stoner and inventor community laboriously participates in Matplotlib's ongoing development and advancement. This guarantees that druggies can use a variety of tools and coffers to produce and ameliorate their plots.

• *Scikit-Learn:*

The Python machine learning library Scikit-Learn is strong and simple to use. It offers a variety of supervised and unsupervised literacy styles for bracket, retrogression, clustering, and dimensionality reduction and is grounded on NumPy, SciPy, and Matplotlib. Because Scikit-Learn is open-source and cost-free, data scientists and machine literacy suckers of all skill situations can use it. The straightforward and harmonious API of Scikit-Learn, which facilitates the operation of numerous factors and their emulsion, is a noteworthy aspect of the software. druggies may test out multiple algorithms and estimate how they perform on different datasets thanks to its modular nature. fresh data pre-processing styles supported by Scikit-Learn include scaling, normalisation, insinuation, and point selection. Algorithms including logistic retrogression, decision trees, arbitrary timbers, and support vector machines are included in Scikit-Learn for bracket problems. Scikit-Learn offers direct retrogression, crest retrogression, and lariat retrogression for tasks using retrogression. Scikit-Learn also offers clustering styles including K-Means, DBSCAN, and hierarchical clustering.

• *Keras & Tensorflow:*

Keras and TensorFlow are two excellent open-source frameworks for Python that may be used to construct and train machine learning models. An end-to-end platform called TensorFlow is used to create and deploy machine learning models, and Keras is an API for high-level neural networks that has been developed on top of TensorFlow. Together, these two libraries provide a strong and efficient solution to create, train, and deploy machine learning models for a wide range of applications.

TensorFlow is a flexible and scalable platform for developing and training machine learning models, such as deep neural networks. It has a comprehensive collection of modelling tools and APIs, including a high-level Keras API that allows users to create models fast and easily. Furthermore, TensorFlow offers abilities for distributed training that let users train models simultaneously across multiple machines, greatly reducing training times.

On the other hand, Keras offers an application programming interface (API) for creating neural networks, making it simple to start applying deep learning. It provides a simple interface for constructing models, allowing users to develop

sophisticated architectures with only a few lines of code. Keras also includes a variety of pre-built models, including as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), that can be used for a variety of applications.

Keras and TensorFlow collaborate with one another to create a secure and flexible environment for creating and teaching models for machine learning in Python. Users may rapidly and easily develop and train models for a variety of applications, including natural language processing, computer vision, and more, using their rich collection of tools and APIs.

➤ *Machine Learning:*

A fast-developing area of artificial intelligence called "machine learning" focuses on creating algorithms that automatically learn from experience and get better over time without being manually programmed. It is a branch of artificial intelligence that allows machines to learn from their experiences and develop without explicit programming.

Large datasets can be used to train machine learning algorithms, which can then be applied to new data to generate predictions or choices. Machine learning algorithms come in a variety of forms, such as supervised learning, unsupervised learning, and reinforcement learning.

Supervised learning entails training a model on labelled data with an already known outcome. During this training, the model uses fresh data to make predictions.

Unsupervised learning entails training a machine learning algorithm on unlabeled data and letting it find relationships or patterns on its own. With reinforcement learning, a model is trained through a process of experimentation, receiving input regarding its actions and changing how it acts as necessary.

➤ *Software Requirements Specification:*

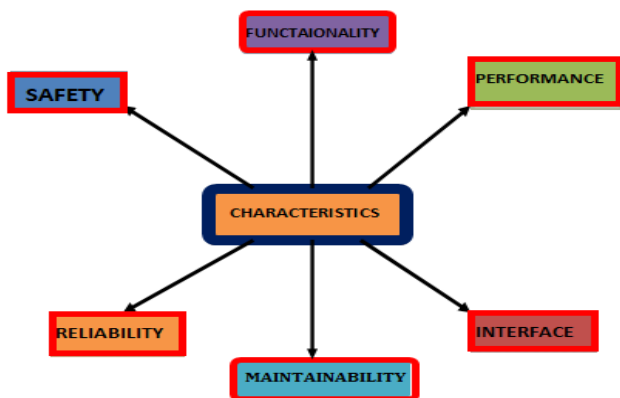


Fig 2 SRS

SRS is a comprehensive description of the system's projected performance. At the conclusion of the requirements engineering phase [fig:2], it is typically approved. It outlines how a software system will

communicate with all internal components, hardware, other programmes, and human users in a variety of realistic situations.

- *Reliability:* It is reliable as it provides safety to the person who is using it.
- *Functionality:* It is an application which is used to provide currency exchange rates prediction.
- *Safety:* As its main aim is to provide safety by generating currency exchange rate. As our model is well trained with cleaned data gathered from secured websites.
- *Interface:* This application interacts with the people by generating accurate graph predictions
- *Maintainability:* This application can be maintained easily because there is no need for a person to check his mobile to see what the notification he received as this application provides voice messages. It even says about the emergency of the call.
- *Performance:* It is an application which generates an accurate currency exchange rates prediction.

➤ *Existing System:*

Numerous research has looked into how COVID-19 has affected the foreign exchange market. The volatility of foreign currency markets was investigated in these research using conventional regression techniques. The predictability of currency rates during COVID-19 and non-COVID-19 periods, however, was not taken into account in these analyses. The majority of the techniques used to forecast the foreign exchange rate are based on statistical research. The exchange rates of 21 currencies versus the USD are predicted in this study using machine learning techniques. We employ the Long Short-Term Memory (LSTM) method, a recurrent neural network algorithm that is currently one of the most effective methods in the deep learning space. Time-series data analysis is one area where LSTM excels. The absence of memory in neural networks other than LSTM is one of their drawbacks, which has serious implications for time-series data. By incorporating both a short-term and long-term memory component, LSTM solves this problem. When the input and output have different sizes, a conventional recurrent neural network (RNN), such as the LSTM, cannot handle the data.

• *Forex Market & Currency Exchange Rate System:*



Fig 3 Currency Price Influencing Factors

Fundamentally, the foreign exchange market is categorised as a liquid market with open information that is equally accessible to all dealers. They have similar expectations, which increases the dependence of the foreign exchange rate. The central banks of every nation and numerous other organisations are all cooperating closely to stabilise or raise the value of their own currencies at the same time. For instance, the Federal Reserve Bank of New York is in charge of activities relating to foreign currency rates in the United States. The bank oversees the U.S. foreign currency reserve, keeps an eye on changes in the world financial markets, and occasionally intervenes in the market as needed. To maintain the value, the bank buys and sells foreign currencies.

• *Factors Influencing Forex Market:*

Prior to forecasting and predicting forex and currency exchange rates, it is important to analyse all the reasons that could cause currency prices to increase or decrease. This is because prices are influenced by a variety of factors.[Fig:3].

Future occurrences of these elements will alter market pricing as well. In other words, in order to grasp the market pulse, it is essential to understand the components. eleven elements that affect currency prices include the following:

- ✓ Inflation
- ✓ Rate of interest
- ✓ Capital account balance
- ✓ Role of speculators
- ✓ Cost of manufacture
- ✓ Debt of the country
- ✓ Gross domestic product
- ✓ Political stability and economic performance
- ✓ Employment data
- ✓ Relative strength of other currencies
- ✓ Macroeconomic and geopolitical events

Let's look at how interest rates impact currency pricing in the markets, for example. When a country's interest rate rises, investors become more interested in investing there because they can earn higher returns on their savings, which are typically held in the local currency. As a result, the demand for that currency rises, which has an impact on how much it appreciates when new currency enters the market. [Fig:1]. Although financial institutions hire professionals and experts to use the tools at their disposal and forecast potential directions for various currencies based on these factors. Machine learning is one of these techniques, and its use is expanding with time.

• *Disadvantages of Existing System:*

In the ARIMA model, the efficiency and accuracy of the system predictions will be done only when the dataset includes the values that are consistent in nature. If the values in the dataset are not consistent in nature, it'll be hard to predict through the ARIMA model. In RNN, the issue of storing the dataset values is highlighted as the main issue to deal with. However, recurrent neural networks are the most promising algorithm for predicting currency exchange rates.

LSTM is the new methodology to confront the issue of storage efficiently.

In LSTM (long short-term memory), time series data is analysed well. However, the LSTM algorithm works well, only when the input and output dataset values are of the same size. The size difference of input and output variables results in less accurate predictions.

➤ *Proposed System:*

To estimate currency exchange rates during the COVID-19 pandemic and compare them to values during the regular non-COVID-19 period, our study makes use of the best machine learning and deep learning algorithms. Accurate exchange rate forecasting aids in improving the number and quality of wise management decisions and helps entrepreneurs and policymakers better plan their budgets. Our research demonstrates that the suggested ensemble deep learning approach offers a reliable prediction performance, successfully predicting for various time-series data clusters in our study.

• *Advantages of Proposed System:*

Our approach will completely deal with all the above-mentioned factors. [Fig:4]. With the help of emerging technology Machine Learning we're able to overcome all the issues simultaneously offering accurate predictions. This approach will deal although the data is not in consistent nature. Storage will be less required as it already trained well ahead of predictions. It works and includes the values from the dataset as well as test data irrespective of their sizes.

➤ *System Architecture:*

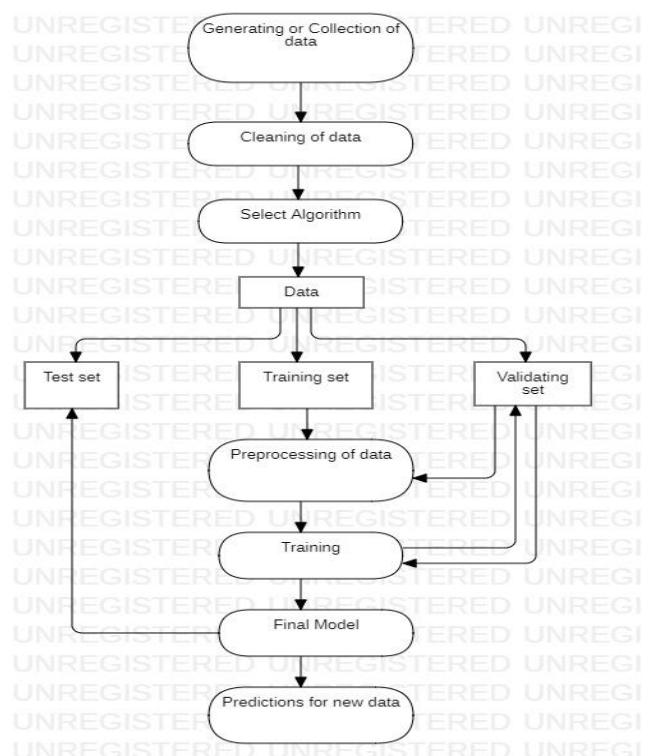


Fig 4 System Architecture

Initially, the system constitutes of the dataset that was retrieved from the Google websites. Then the system collects or gathers the labelled data. Here labelled data means, the dataset might contain data in unsorted order. So, before system consider the dataset as it is it was given, it generates or collects the labelled the data. Later, the immediate next step of it was cleaning the labelled data. Here cleaning of the data means, the dataset might consist of errors like there might be unfulfilled data values somewhere in the dataset or there might be some repeated values, etc. So, this step plays a significant role in initial processing of data. After completion of the above two steps, algorithm selection was done. In this system software, we choose Decision Node Regression Algorithm. After this the actual process of system design starts. The algorithm takes the labelled clean dataset as data, and make the dataset undergo three steps. 1. Testing set 2. Training set 3. Validation set. The test set consists of data that was tested and help to analyse the data during testing phase. Training set consists of data and trains itself to improve its experience and performance. Validation set consists of correct data, it validates the data during training phase. Pre-processing of data will be obtained from training set as well as from validation set. The data will get ready to be processed further in the designed procedure. Training is a process where a system gains experience and get chance to improve its performance. The training process initially considers a set of values from the dataset and analysis the other parameters on predicting how variations of the predictions done earlier in the dataset. And predicts a new set of values with its gained knowledge, checks whether the predicted values match with the dataset values. Likewise, the system continuously trains itself automatically and allows its predictions to test with the dataset. The final model will undergo testing and tests the predicted values for improving the model at every prediction. Like this the system predictions will be done.

➤ *Future Scope:*

Since the limitations of the study mentioned before are pivotal, resolving those challenges would be a great help in perfecting the delicacy and trust ability of the results of this study. thus, the first future work can be a combination of literal data with diurnal fiscal and political news analysis using natural language processing (NLP) models. The alternate suggestion for delicacy and trust ability advancements is to assay the factors mentioned in the last chapters and examine whether collecting the data from those factors, which affect the currency prices directly, can be combined with literal data or not. (Fig2) (Fig3) How accurate would the algorithms be if some of those factors were combined with literal data to train and test them? According to the author, they will have pivotal impacts on the result if the birth and collection of data are conducted precisely and consequently. Predicting currency exchange rates doesn't feel insolvable. It can be possible in numerous ways. According to the authors, machine literacy will be suitable to prognosticate currency rates precisely veritably soon. The impact would be that if the technology is handed to world business leaders, the gap between the societies will increase fleetly, as it did ever. But there's one stopgap that

each technology that humans construct can control itself and balance the damage with its utility.

II. CONCLUSION

Our experiment was in line with the hypothesis we proposed and was able to prove the Decision Node Regression model was the best among the other chosen models which are Raw RNN and ARIMA for long term prediction. Our system made to extend the training of the RNN model for a short-term prediction and short data set. [Fig:4]. Avoiding normalization. Applying large datasets as well as memory management are our primary focuses. In short and long term. Also, the work of our project extends the working capability over large datasets. It was established, theoretically and empirically that the proposed system can generate profitable signal without prior knowledge about currency market. Decision tree algorithm clearly show how the logic are connected together to arrive at a decision before signal is generated. Statistically, this project has proven that in every ten predictions, seven will be accurate and profitable regardless of the negative value generated from invalid signal generated.

REFERENCES

- [1]. Achelis S. B. (1995) *Technical Analysis from A to Z*. Probus Publishing, Chicago.
- [2]. Alamili, M. (2011) *Exchange Rate Prediction Using Support Vector Machines: A Comparison with Artificial Neural Networks*. A Master Thesis Submitted to the Faculty of Technology, Policy and Management Section of Information and Communication Technology, Delft University of Technology.
- [3]. Allen F., Karjalainen R. (1999). Using Genetic Algorithms to Find Technical Trading Rules. *Journal Finance Economics* 51, 245–271. Appel, Gerald (1999). *Technical Analysis Power Tools for Active Investors*. Financial Times Prentice Hall. pp. 166.
- [4]. Bachelier, L. (1900). *Théorie de la spéculation*, Gauthier-Villars, Paris, *Annales Scientifiques de l'École Normale Supérieure* 3 (17): 21–86
- [5]. Ball R. (1978) *Filter Rules: Interpretation of Market Efficiency, Experimental Problems and Australian Evidence*. *Accounting Education* 18,1–17.
- [6]. Ben Omrane, W., Bauwens, L., Giot, P. (2005). News announcements, market activity and volatility in the euro/dollar foreign exchange market. *Journal of International Money and Finance* 24 (7), 1108e1125.
- [7]. Bessembinder H., Chan K. (1995). The Profitability of Technical Trading Rules in the Asian Stock Markets. *Pacific Basin Finance Journal* 3, 257–284.
- [8]. Bessembinder H., Chan K. (1995). The Profitability of Technical Trading Rules in the Asian Stock Markets. *Pacific Basin Finance Journal* 3, 257–284
- [9]. Bessembinder H., Chan K. (1998). Market Efficiency and the Returns to Technical Analysis. *Financial Management* 27, 5–17.

- [10]. Bilson, J.F.O. (1992). Technical currency trading. Chicago, I 11; The Chicago Corporation.
- [11]. Bodt, E., Rynkiewicz, J., Cottrell, M. (2001). Some known facts about financial data. European symposium on artificial neural networks 25-27. pp. 223-236.
- [12]. Tenti,P., (1996). Forecasting foreign exchange rates using recurrent neural networks. Applied Artificial Intelligence 10, 567–581.
- [13]. Trippi, R.R., and D. DeSieno (1992). Trading equity index futures with a neural network; J Portfolio Management 19 27-33.
- [14]. Monica Lam (2004). Neural network techniques for financial performance prediction: integrating fundamental and technical analysis, Volume 37, Issue 4, Data mining for financial decision making, Pages 567-581.
- [15]. Murphy, J. J. (1999). Technical Analysis of the Financial Markets. New YorkInstitute of Finance.
- [16]. Murphy, J. J. (2000). Charting Made Easy. Marketplace Books (Wiley).

BIOGRAPHIES



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