Auto Trading with ML

T.E. mini-project report submitted in partial

fulfilment of the requirements of the degree of

Information Technology

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2021–2022

CERTIFICATE

This is to certify that the T.E. mini-project entitled **"Auto Trading with ML"** is a bonafide work of **"Aniket Bane" (09) [TEIT-1], "Gaurav Konde" (55) [TEIT-1],** and **"Nupur Mahadik" (63) [TEIT-1], "Saurabh Mahajan" (64) [TEIT-1]** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of**"Information Technology"** during the academic year 2021–2022.

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T.E. Mini-Project Report Approval

This mini-project synopsis entitled ***Auto Trading with ML*** by ***Aniket Bane, Gaurav Konde, Nupur Mahadik, Saurabh Mahajan*** is approved for the degree of ***Information Technology*** from the ***University of Mumbai***.

Examiners

1. 

2.

Date:

Place:

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Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will cause disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

Stock market decision-making is a very challenging and difficult task of financial data prediction. Prediction about the stock market with high accuracy movement yield profit for investors of the stocks. Because of the complexity of stock market financial data, development of efficient models for prediction decision is very difficult, and it must be accurate. This study attempted to develop models for prediction of the stock market and to decide whether to buy/hold the stock using data mining and machine learning techniques.

Financial time series predictions are a challenge due to their nonlinear and chaotic nature. In recent decades, many researchers and investors have studied methods to improve quantitative analysis. In the field of artificial intelligence, sophisticated machine learning techniques, such as deep learning showed better performance. In this paper, an automated trading system is built to predict future trends of stock index prices.

Using an LSTM-based agent to learn temporal patterns in the data, the algorithm triggers automatic trades according to the historical data, technical analysis indicators, and risk management. The results demonstrate that the proposed method, called LSTM-RMODV, shows better performance when compared with other methods, including the buy-and-hold technique. The proposed method also works in bear or bull market conditions, showing a rate over net income based on invested capital of 228.94%. That is, despite the low accuracy, the algorithm is capable of generating consistent profits when all the transaction costs are considered.

Keywords - stock market prediction; technical analysis; automated stock market trading.

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Chapter 1

Introduction

Just because somebody advises you to invest in security, does not mean you blindly go and invest in it. It is important to study the company, the shares, and the performance in the market before going forward with any investment. Nowadays there are big ups and downs in the stock market. Therefore, a hub which would predict accurate stock prices is essential.

An Auto Trading System (ATS), uses a computer program to create buy and sell orders and automatically submits the orders to a market center or exchange.

The computer program will automatically generate orders based on a predefined set of rules using a trading strategy that is based on technical analysis, advanced statistical and mathematical computations, or input from other electronic sources.

Once the automated system is completed, investors can take a slightly more hands-off approach, as this vision hub will complete the majority of the work.

Predicting the accurate stock price has been the aim of investors ever, Millions of dollars worth of trading happens every single day, and every trader hopes to earn profit from his/her investments.

1.1 Motivation

Businesses primarily run over customer satisfaction, and customer reviews about their products. Shifts in sentiment on social media have been shown to correlate with shifts in stock markets. Identifying customer grievances and thereby resolving them leads to customer satisfaction as well as the trustworthiness of an organization. Hence there is a necessity for an unbiased automated system to classify customer reviews regarding any problem. In today's environment where we're justifiably suffering from data overload (although this does not mean better or deeper insights), companies might have mountains of customer feedback collected; but for mere humans, it's still impossible to analyze it manually without any sort of error or bias. Oftentimes, companies with the best intentions find themselves in an insights vacuum.

You know you need insights to inform your decision making and you know that you're lacking them, but don't know how best to get them. Sentiment analysis provides some answers to what the most important issues are, from the perspective of customers, at least. Because sentiment analysis can be automated, decisions can be made based on a significant amount of data rather than plain intuition.

It greatly reduces the impact of market volatility on investor sentiment and avoids making irrational investment decisions when the market is extremely fanatical or pessimistic.

It is an essential vision hub for investors to avoid human subjective judgment errors. It also has the advantages of high efficiency, discipline, and systematic, and it also saves labor costs and time too.

1.2 Problem Statement

The accuracy of the existing trading systems and stock price prediction models is relatively low because only a small dataset is used for training, the results will be less accurate. There is still a need to continually explore more new features that are more predictable.

The purpose of this project is to build an automated trading system that uses Machine Learning methods to ensure profitability. Creating an ML-based trading system allows for an investor to design a self-automated trading system that will help the traders for making profits.

This automated system creates a trading strategy that can keep a trader from making costly mistakes that usually arise from relying on their intuition or on any other individual.

1.3 Objectives

It greatly reduces the impact of market volatility on investor sentiment and avoids making irrational investment decisions when the market is extremely fanatical or pessimistic.

It is an essential vision hub for investors to avoid human subjective judgment errors. It also has the advantages of high efficiency, discipline, and systematic, and it also saves labor costs and time too.

The advantage of using this automated system is that it helps automate the analysis and the interpretation of the market statistics.

This ML-based system can gather the market data, and interpret and calculate the potential risk in the market.

1.4 Scope

This automated trading System ensures a non-emotional, systematic approach to trading.

Time is money and when it comes to the auto trading system millions of computations and thousands of transactions across various time zone and markets are almost done instantaneously.

The cryptocurrency market is highly volatile, which is why a prudent trading strategy should include risk diversification, and one way to diversify that risk is to run and implement this automated the trading system.

This Automated System responds immediately to changing market conditions,and automated systems are able to generate orders as soon as trade criteria are met.. As soon as a position is entered, all other orders are automatically generated, including protective stop losses and profit targets.

Chapter 2

Review of Literature

Sr No.	Title	Author	Publication	Approach	Link
1.	Automated Trading System for Stock Index Using LSTM Neural Networks and Risk Management	Thalita R. Silva, Audeliano W. Li, Edson O. Pamplona	IEEE 2020	In this paper we get an idea of an automated trading system is built to predict future trends of stock index prices. Agent to learn temporal patterns in the data, the algorithm triggers automatic trades according to the historical data, technical analysis indicators, and risk management.	https://ieeexplore.ieee.org/abstract/document/9207278
2.	Customer Adaptive Automated Trading System with Capital Risk Analysis using Machine Learning	Harsh Agarwal, Aditi Kandoi, Bhavya Ahir, Sudhir Dhage	IEEE 2021	This paper explains filtration and different trading strategies using RoCE and Fuzzy Logic to solve the problem and predict the portfolio values. It also takes into consideration the sentiment aspect of trading using NLP and combines the two to efficiently to perform trading.	https://ieeexplore.ieee.org/document/9451776

Table 1: Literature Survey

Sr No.	Title	Author	Publication	Approach	Link
3.	Regression and LSTM based Machine learning to predict stock values.	Ishita Parmar, Navashu Agarwal, Sheirsh Saxena, Ridam Arora	IEEE 2020	In Stock Market Prediction, the aim is to predict the future value of the financial stocks of a company. The paper focuses on the use of Regression and regression based Machine learning to predict stock values. Factors considered are open, close, low, high and volume.	https://ieeexplore.ieee.org/document/8703332
4.	Stock Market Analysis Using Linear Regression and Decision Tree Regression	R. Karim, M. K. Alam and M. R. Hossain	IEEE 2021	This paper works in two methods - Linear Regression and Decision Tree Regression. Two models like Linear Regression and Decision Tree Regression are applied for different sizes of a dataset for revealing the stock price forecast prediction accuracy.	https://ieeexplore.ieee.org/document/9515762

Table 1: Literature Survey

Automated Trading System for Stock Index Using LSTM Neural Networks and Risk Management (IEEE 2020):

Financial time series predictions are a challenge due to their nonlinear and chaotic nature. In recent decades, many researchers and investors have studied methods to improve quantitative analysis. In the field of artificial intelligence, sophisticated machine learning techniques, such as deep learning showed better performance. In this paper, an automated trading system is built to predict future trends of stock index prices. Using an LSTM-based agent to learn temporal patterns in the data, the algorithm triggers automatic trades according to the historical data, technical analysis indicators, and risk management. The results demonstrate that the proposed method, called LSTM-RMODV, shows better performance when compared with other methods, including the buy-and-hold technique. The proposed method also works in bear or bull market conditions, showing a rate over net income based on invested capital of 228.94%. That is, despite the low accuracy, the algorithm is capable of generating consistent profits when all the transaction costs are considered.

Customer Adaptive Automated Trading System with Capital Risk Analysis using Machine Learning (IEEE 2021):

Stock market plays a huge role in the economy of our country. Several attempts have been made to analyse and predict the stock market. While the existing systems try to exploit the patterns of stock prices using historical data, they do not take into the account the poor performance of the system. Moreover, there is no system which provides user specific trading strategies. The proposed solution explores filtration and different trading strategies using RoCE and Fuzzy Logic to solve the problem and predict the portfolio values. It also takes into consideration the sentiment aspect of trading using NLP and combines the two to efficiently to perform trading for even those users who have smattering knowledge about stock market thereby making it suitable for everyone.

Stock Market Prediction Using Machine Learning (IEEE 2020):

In Stock Market Prediction, the aim is to predict the future value of the financial stocks of a company. The recent trend in stock market prediction technologies is the use of machine learning which makes predictions based on the values of current stock market indices by training on their previous values. Machine learning itself employs different models to make prediction easier and authentic. The paper focuses on the use of Regression and LSTM based Machine learning to predict stock values. Factors considered are open, close, low, high and volume.

Stock Market Analysis Using Linear Regression and Decision Tree Regression (IEEE 2021):

In business, the Stock market or Share market is a more perplexing and sophisticated way to do business. Every business owner wants to reduce the risk and make an immense profit using an effective way. The bank sector, brokerage corporations, small ownerships, all depends on this very body to earn profit and reduce risks. However, using the machine learning algorithm of this paper to predict the future stock price and shuffle by using subsist algorithms and open source libraries to assist in inventing this unsure format of business to a bit more predictable. The proposed system of this paper works in two methods - Linear Regression and Decision Tree Regression. Two models like Linear Regression and Decision Tree Regression are applied for different sizes of a dataset for revealing the stock price forecast prediction accuracy. Moreover, the authors of this paper have revealed some development that could be the club to acquire better validity in these approaches.

Chapter 3

Report on Present Investigation

Over the most recent two decades determining of stock returns has become a significant field of research. In the majority of the cases the scientists had endeavored to build up a straight connection between the information macroeconomic factors what's more, the stock returns, be that as it may, with the revelation of non linear slants in the financial exchange record returns, there has been an incredible move in the focal point of the scientists towards the nonlinear expectation of the stock returns. Despite the fact that, thereafter numerous writing have come up in nonlinear measurable displaying of the stock returns, the majority of them required that the nonlinear model be indicated before the estimation is done. in any case, for the explanation that the financial exchange returns being boisterous, unsure, confused and nonlinear in nature.

There are various functions used to forecast the parameters. Mainly nclude, binary threshold, linear threshold, hyperbolic sigmoid, and brown. The Investigation of Stock Market Prediction Using Machine Learning Approach has been mentioned. The stock exchange forecast has become a sharp area of interest. Particular assessment is one of them, yet it does not reliably deliver specific results, so it is essential to develop strategies for progressively accurate gauge. All the procedures recorded under the backslide have their own ideal conditions and obstacles over their various accomplices. The way in which straight backslide models act is that they are consistently fitted using the least squares approach, however they may be fitted in different habits, for example by reducing the "non-appearance of fit" in some other standard, or by diminishing a disabled variation of the least squares setback work. Again, the least squares approach can be used to fit nonlinear
models.

The impact of the financial ratios and technical analysis on stock price forecasting using random forests, The use of AI and human-made awareness frameworks to predict stock costs is a growing example. A constantly increasing number of experts spend their time every day considering ways to deal with techniques that can further improve the precision of the stock conjecture model. As a result of the galactic number of decisions available, there can be n number of ways on the most capable strategy to envision the expense of the stock, anyway all techniques don't work a comparable way.

3.1 Proposed System (Solution)

Existing System	Proposed System (Solution)
1. There are automate trading platform in market like Royal Q but it costs 120 USD means near about 10,000 Rs. charges for opening the trading account. 2. Portfolio Tracking Absent. 3. In market most of the existing automate trading systems does not provide stocks price rate prediction for future on the trading platform.	1. The automated trading system we are designing costs as much less than the charges for starting the trading account. 2. Portfolio Tracking Present. 3. In our proposed system, we will provide stock price rates for the future in the format of the graph, which will help the traders in the right stock investment and make it easy for new traders also who are new in the market.

Table 2: Existing System and Proposed System (Solution)

3.1.1 Block diagram

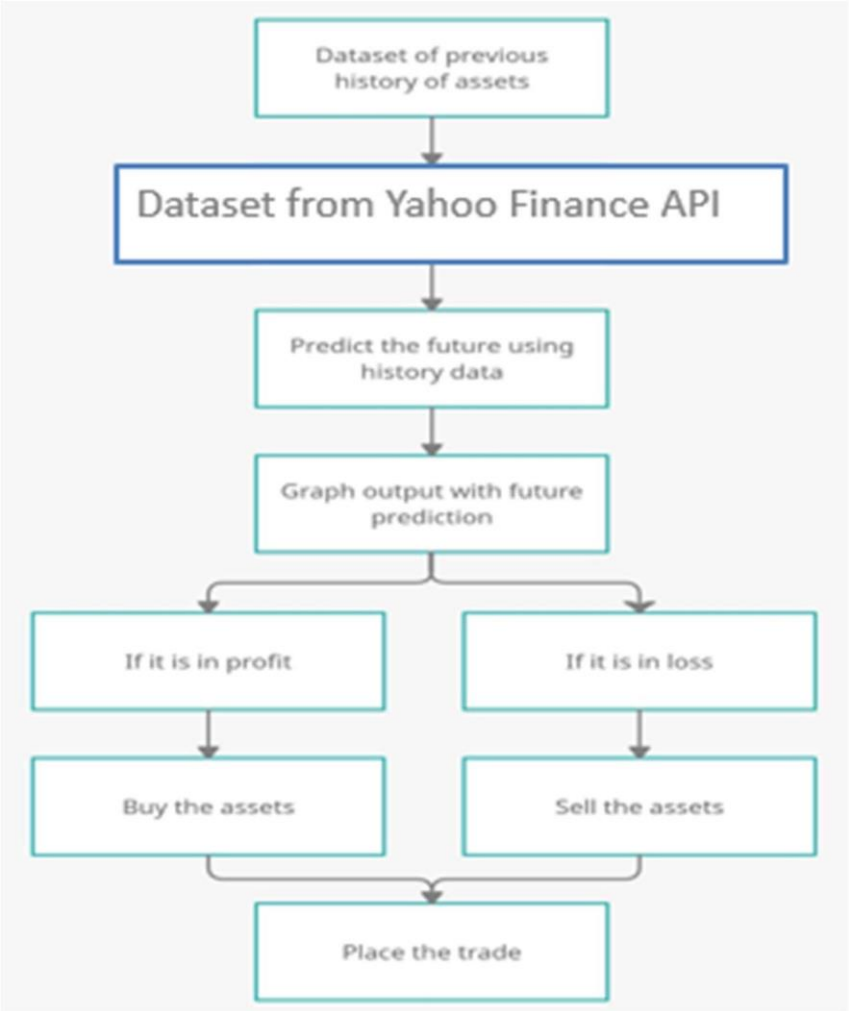

Figure 1: Proposed System

3.1 Implementation

- **Software Used:**
- **VS Code**

- **Languages Used:**
- **Python**

- **Python Libraries Used:**
- **Numpy:** NumPy can be used **to perform a wide variety of mathematical operations on arrays**. It adds powerful data structures to Python that guarantee efficient calculations with arrays and matrices and it supplies an enormous library of high-level mathematical functions that operate on these arrays and matrices.

- **Panadas:** Pandas is mainly used for **data analysis and associated manipulation of tabular data in Data Frames**. Pandas allows importing data from various file formats such ascomma-separated-valuess, JSON, Parquet, SQL database tables or queries, and Microsoft Excel.

- **Matplotlib:** Matplotlib is **a cross-platform, data visualization and graphical plotting library for Python** and its numerical extension NumPy. As such, it offers a viable open source alternative to MATLAB. Developers can also use matplotlib's APIs (Application Programming Interfaces) to embed plots in GUI applications.

- **Sklearn:** The sklearn library contains a lot of efficient tools for machine learning and statistical modeling including classification, regression, clustering and dimensionality reduction. Please note that sklearn is used **to build machine learning models.**

- **Tensorflow:** TensorFlow is an open-source library developed by Google primarily for **deep learning applications**. It also supports traditional machine learning. TensorFlow was originally developed for large numerical computations without keeping deep learning in mind.

- **Binance:** The Binance API is a method that allows you to **connect to the Binance servers via Python or several other programming languages**. With it, you can automate your trading. More specifically, Binance has a RESTful API that uses HTTP requests to send and receive data.

3.2.1 ML Algorithm

1. Get the dataset from the Yahoo Finance API to train the model for a particular asset.

2. By implementing the LSTM model Algorithm.

3. Get the client API key and client secret key.

4. Then use it to retrieve data from the Yahoo Finance API.

5. Get the portfolio data of the user.

6. Use the history of some hours or days then use the model to predict the future.

7. Based on the prediction take the user's input and place an order.

8. If the prediction says profit then ask the user whether he wants to buy it if yes ask the quantity and place the order directly or vice versa.

Long Short-Term Memory (LSTM) networks are a type of recurrent neural network capable of learning order dependence in sequence prediction problems.

Below are some points that explain why we should use LSTM model Algorithm:
LSTM is widely used for sequence prediction problems and has proven to be extremely effective.

LSTM can store past important information and forget the information that is not.

LSTM provides us with a large range of parameters such as learning rates, and input and output biases.

Long short-term memory (LSTM) is a type of recurrent neural-network architecture in which the vanishing gradient problem is solved. LSTMs are capable of learning very long-term dependencies and they work tremendously well on a large variety of problems. LSTMs are first introduced by Hochreiter et al. in 1997. In addition to the original authors, many researchers contributed to the architecture of modern LSTM cells.

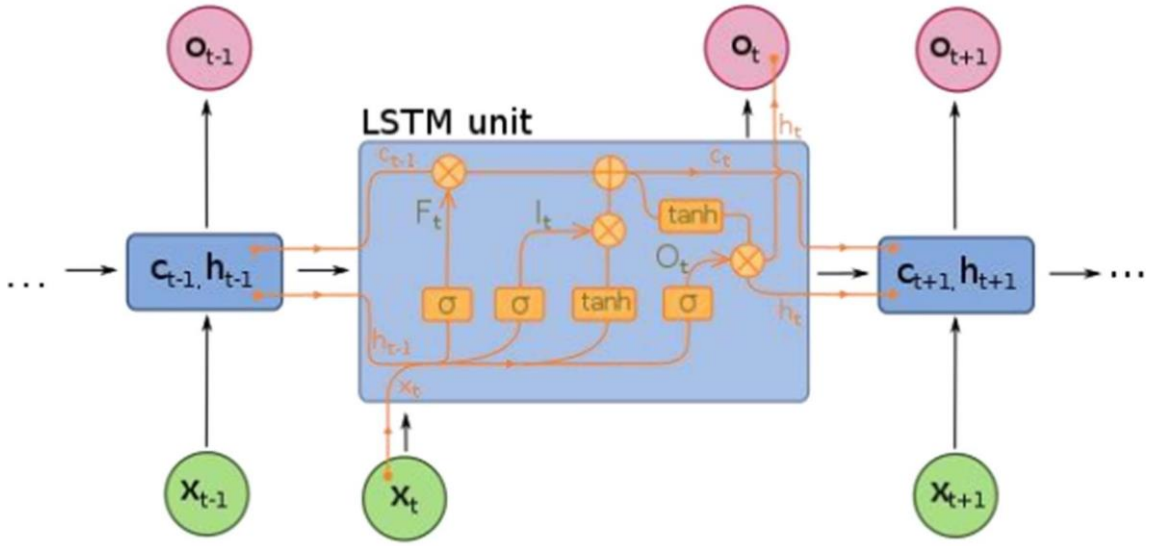

Figure 2: LSTM UNIT

3.2.2 Data Preparation

Dataset Used: We are getting the Dataset of a particular cryptocurrency against US dollars from Yahoo Finance API.

Operations Performed on Dataset:

1. Filter: Filter the records by multiple criteria or conditions, i.e.by filtering multiple column values (more than one column).

2. Read: Reading is an action to acquire data from a source and place it into their volatile memory for processing.

3. Concatenate: Logically linking data sets in a series or chain.

Firstly Receiving the data we filtered the received data and perform the reading operation on the dataset and then concatenated the Received information as per the requirement in Prediction.

3.2.3 Pseudo Code

Github Link: https://github.com/Gauravk2610/Auto-trading-with-Ml

```
   from pickletools import optimize
from turtle import color
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import pandas_datareader as web
import datetime as dt
from sklearn.metrics import accuracy_score
from sklearn.preprocessing import MinMaxScaler
from tensorflow.keras.layers import Dense, Dropout, LSTM
from tensorflow.keras.models import Sequential

from binance import Client, ThreadedWebsocketManager,
ThreadedDepthCacheManager


crypto_currency = 'MATIC'
against_currency = 'USD'

start = dt.datetime(2016, 1, 1)
end = dt.datetime.now()

data = web.DataReader(f'{crypto_currency}-{against_currency}', 'yahoo', start, end)

# print(data)

# Prepare Data
scaler = MinMaxScaler(feature_range=(0, 1))
scaled_data = scaler.fit_transform(data['Close'].values.reshape(-1, 1))

prediction_days = 60
future_days = 30

x_train, y_train = [], []

for x in range(prediction_days, len(scaled_data)):
    x_train.append(scaled_data[x-prediction_days:x, 0])
    y_train.append(scaled_data[x, 0])
```

```
# future
# for x in range(prediction_days, len(scaled_data) - future_days):
#     x_train.append(scaled_data[x-prediction_days:x, 0])
#     y_train.append(scaled_data[x+future_days, 0])

x_train, y_train = np.array(x_train), np.array(y_train)
x_train = np.reshape(x_train, (x_train.shape[0], x_train.shape[1], 1))

# Create Neural Network

model = Sequential()

model.add(LSTM(units=50, return_sequences=True, input_shape=(x_train.shape[1],
1)))
model.add(Dropout(0.2))
model.add(LSTM(units=50, return_sequences=True))
model.add(Dropout(0.2))
model.add(LSTM(units=50))
model.add(Dropout(0.2))
model.add(Dense(units=1))

model.compile(optimizer='adam', loss='mean_squared_error')
model.fit(x_train, y_train, epochs=25, batch_size=32)
# Testing the Model

test_start = dt.datetime(2020, 1, 1)
test_end = dt.datetime.now()

test_data = web.DataReader(f'{crypto_currency}-{against_currency}', 'yahoo',
test_start, test_end)
actual_prices = test_data['Close'].values

total_dataset = pd.concat((data['Close'], test_data['Close']), axis=0)

model_inputs = total_dataset[len(total_dataset) - len(test_data) -
prediction_days:].values
model_inputs = model_inputs.reshape(-1, 1)
model_inputs = scaler.fit_transform(model_inputs)
```

```
x_test = []

for x in range(prediction_days, len(model_inputs)):
    x_test.append(model_inputs[x-prediction_days:x, 0])

x_test = np.array(x_test)
x_test = np.reshape(x_test, (x_test.shape[0], x_test.shape[1], 1))

prediction_prices = model.predict(x_test)
prediction_prices = scaler.inverse_transform(prediction_prices)
# accuracy_score(prediction_prices, actual_prices)

plt.plot(actual_prices, color='black', label='Actual Prices')
plt.plot(prediction_prices, color='green', label='Predicted Prices')
plt.title(f'{crypto_currency} price prediction')
plt.xlabel('Time')
plt.ylabel('Price')
plt.legend(loc='upper left')
plt.show()

# Predict next day
real_data = [model_inputs[len(model_inputs) + 1 - prediction_days:len(model_inputs)
+ 1, 0]]
print(real_data)
real_data = np.array(real_data)
real_data = np.reshape(real_data, (real_data.shape[0], real_data.shape[1], 1))

print(real_data)
accuracy_score(real_data, real_data)

# predicition = model.predict(real_data)
# predicition = scaler.inverse_transform(predicition)

# print(predicition)
```

```
# while True:

#     response = int(input("Do you want to buy or sell the bitcoin \n Choose 1. To buy\n
2. To sell \n3. To Exit\n"))

#     if (response == 1 or response == 2):
#         repsonse = input ("Enter the quantity you wanna buy or sell ")
#         if response != 2:
#             order = client.create_order(
#             symbol='MATICUSDT',
#             side='BUY',
#             type='MARKET',
#             quantity=10)
#             print(order)

#         else:
#             order = client.create_order(
#             symbol='MATICUSDT',
#             side='SELL',
#             type='MARKET',
#             quantity=10)
#             print(order)
```

Chapter 4

Model Implementation

4.1 Training of Model

1. We Retrieve the Data set from Yahoo Finance API against the US Dollars, we even specify a time frame to have a start and an endpoint.

2. We create a min-max scalar with the feature range of 0 and 1 to fit the data in it.

3. Then fit the data in the scalar transform then we specify prediction days then we reshape the data as per requirement.

4. We create a neural network using the Sequential Model.

5. We create the Sequential Model and then we add LSTM layers (i.e.Long Short Term Memory Layers) and then Dropout layers, we have used LSTM layers because these layers are so powerful and they memorize important information and feed data back into a neural network.

6. We prevent the overfitting of the network by using Dropout layers then we compile the model (Train the Model).

4.2 Evaluation of Model

1. The input parameters are the integer values of prices of stock from past days to the current day.

2. On the basis of that information our model will predict the outcome.

3. It will do the operation on the values present in the dataset and predict the current day or the future day prediction with 80-85% accuracy.

4. By doing this it helps the traders to get the current position of that particular stock for trade.

Chapter 5

Results:

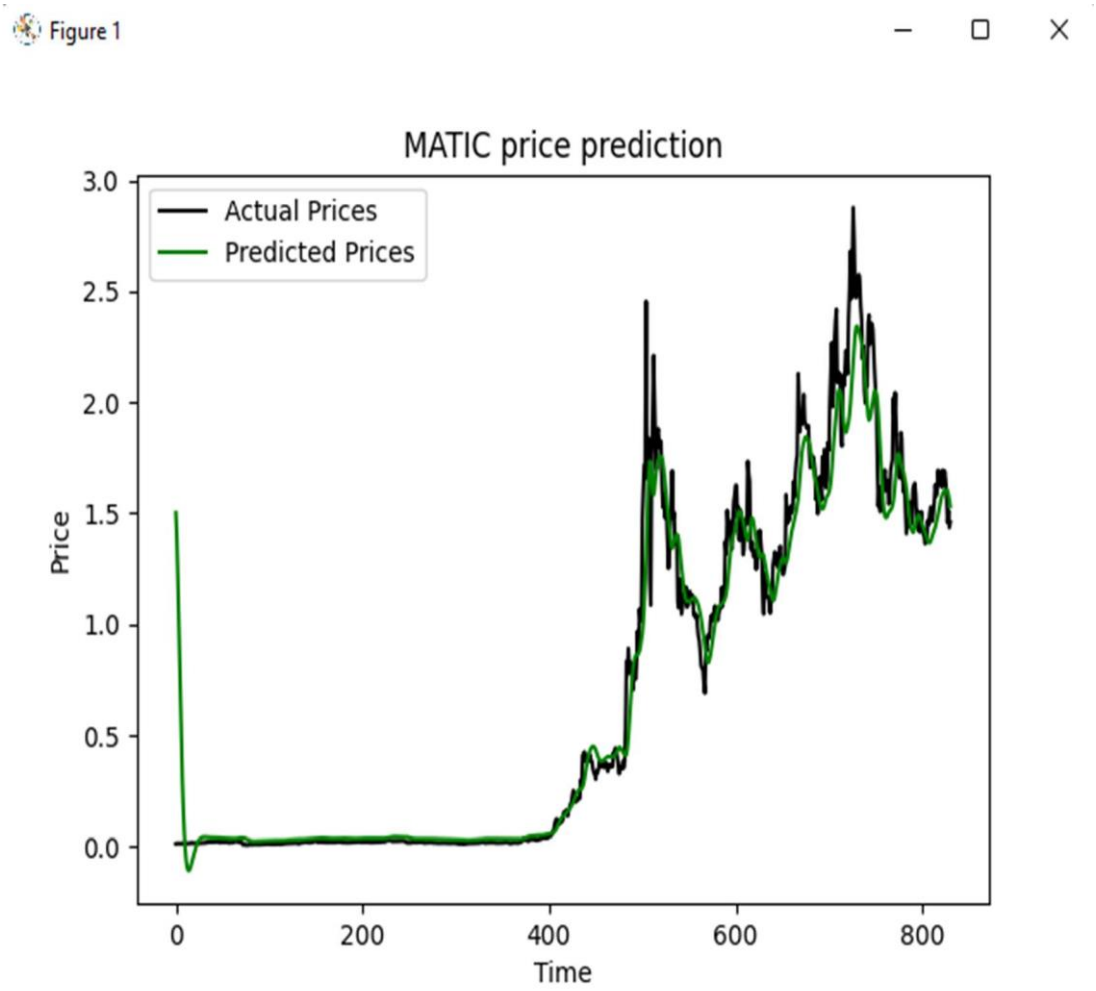

Figure 3: Result Analysis of MATIC Crypto

Prediction of Prices of One Day Basis on Last 60 Days Data of MATIC Crypto Currency against the US Dollars.

In Represented Graph of our Price Prediction, the Black Line of the Graph represents Actual Prices and the Green Line represents Predicted Prices of Asset.

Chapter 6

Conclusions

- Automate trading not only provides Security, Cost, and Speed but is also a revolutionary technology for the future financial markets and economy.

- Automate trading makes it easier for both new traders as well as established ones in getting profitable outcomes with minimized effort, time, and loss.

- The integration of Financial Knowledge with Machine Learning is a demand of future Trading and enhances both Performance and Revenue.

Chapter 7

Future Scope

- We will automate the entire process by making the communication through what's app message.
- Crypto track and transaction updates through what's app message.
- We will keep the portfolio track through the API and keep a track of investments.
- Future scope of this project will involve adding more parameters and factors like the financial ratios, multiple instances, etc.
- The more the parameters are taken into account more will be the accuracy.

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