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Stock Price Prediction

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Abstract: *Stock price prediction serves as afundamental tool for informed financial decision- making This project presents a web-based platform fordifferent users that uses Recurrent Neural Networks (RNNs) to predict stock price. The platform integrateshistorical stock data encompassing opening and closingprices, high and low prices, and trading volume. A comprehensive preprocessing pipeline is established, encompassing data cleaning, normalization, and feature selection. RNN architectures, including Long Short-Term Memory (LSTM) and Gated RecurrentUnits (GRUS), are employed to capture intricate temporal patterns essential for accurate prediction. Thetrained RNN is a model which incorporated into a web interface, allowing users to input stock symbols and obtain real-time predictions. The system's performanceis evaluated by using metrics such as Mean Absolute Error(MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE). This web-based application demonstrates the efficacy of RNNs in stock price prediction and provides an accessible and interactive tool for investors and traders to enhance their financialstrategies.*

Key word: *Prediction, Stock Price Prediction Model, Desktop version.*

I.INTRODUCTION

Any kind of prediction is difficult task, especially where the future is very volatile. The stock market is highly volatile and unpredictable by nature. Therefore, investors are always taking risks in hopes ofmaking some profit. People want to invest in stock market and expect profit from their investments in stocks. That contain factors that influence stock price, such as supply and demand, market trends, the global economy, corporate results, historical price, public sentiments, sensitive financial information, popularity (such as good and bad news related to the company), all ofwhich may result in the increase or decrease in the number of buyers and sellers etc. Even though someone may analyze alot of factors, it is still difficult to achieve the better performance in the stock market and to predict the future price.

1.How we can predict day-before stock prices using only their historical price data?

2.How we can validate the results for the developed model? In this study, a Recurrent Neural Network withLong Short-Term Memory (LSTM) is used by the machine learning technique to analyze and predict the future stock prices based on their historical price.

II RELATED WORK

With the advancement of new technology and statistical tools, many scholars have explored ways to predict the stock prices. In 1997, prior knowledge and neural networks were used to predict the stock price. Later,a genetic algorithm approach and a support vectormachine was introduced to predict stock prices. Lee introduced a stock price prediction using reinforcement learning. In 2008, Chang used a TSK-type fuzzy rule- based system for stock price prediction. In year 2009, Tsai used a hybrid machine learning algorithm to predict the prices of stock. Over time, the scholars predicted the stockprices using different kinds of machine learning algorithms such as deep learning, extreme machine learning and applied econometric approach using machine learning. In year 2015, AM Rather proposed a hybrid model composed of two model (1) i linear and (2) nonlinear. The non-linear model was a recurrent neural network. They found though this approach that it was the non-linear model, the recurrentneural network, that gave a satisfactory prediction of stock prices. In 2018, popular machine learning algorithms such as pattern graphs, convolutional neuralnetworks, artificial neural networks, recurrent neural networks were used to predict stock prices.

III FUNCTIONALITY

To create a stock price prediction project for Google and Tesla stocks, we can follow the project design mentioned earlier. Here's a step-by-step guide on how to work on this project specifically for Google stock:

1. **Project Inception and Planning:** Define the specific objectives: Specify what you want to achieve with both the stock price prediction, such aspredicting the daily closing price or predicting the prices for next quarter.

2. **Scope:** Decide the scope of your project, e.g.,predicting stock prices for the next month or quarter. Success criteria: Define what you consider a successfulprediction. It could be achieving a certain level ofaccuracy or beating a baseline model.

Data sources: Identify reliable sources for Google stockprice data as well as for Tesla stock price data, such asTesla Finance or Google Finance. Timeline and task breakdown: Create a project plan that outlines tasks, deadlines, and responsibilities.

3. Data Collection and Preprocessing:

a) Collect historical stock price data for both stocks, including opening price, closing price, high, low, and volume. (Fig. 1, Fig.

b) Preprocess the data:

Handle missing values, if any. Normalize or standardize the data.
Create input sequences and target values for the RNN.Generate additional features (e.g., moving averages, RSI) as needed.
Split the data into training, validation, and test sets. (Fig. 3, Fig.4)

4. Model Selection and Development: Now we choose LSTM and will define the modelstructure, including the number of layers, units, and dropout rates and setting up hyper parameter tuningexperiments to optimize the model as seen in (Fig. 5).

5. Training and Evaluation:

Train the RNN model on the training dataset usinghistorical stocks data.
Monitor training progress and evaluate the model'sperformance using the validation data.
Use appropriate loss functions and evaluation metrics(e.g., MSE, MAE, RMSE).
We have Implemented early stopping of up to 100 epochs to prevent overfitting.
Visualize training and validation loss curves.

6. Model Testing: Test the trained model on a dedicated test dataset that we have set aside to assess its generalization performance.

7. Visualization and Interpretation: Visualize the model's predictions against actual stockprices. Interpret the model's predictions and assess its abilityto capture market trends specific to Google. (Fig. 6)

IV. SYSTEM ARCHITECTURE

A recurrent neural network (RNN) is a class of advanced artificial neural network (ANN) which involvesdirected cycles in the memory. One main goal of the recurrent neural networks is the ability to build on earlier types of networks with fixed-size input vectors and output vectors. In a recurrent neural network (RNN); connections between nodes form a directed graph alonga sequence which allows exhibiting dynamic temporalbehavior for a time sequence. Suppose one wants to predict the next word in a sentence or to predict the nextday stock price etc. by using Machine Learning. The simplest form has an input layer which receives the input, a hidden layer where the activation is applied andan output layer where one finally receives the output. In more complex forms, where 8 multiple hidden layersare present, the input layer receives the input, the first hidden layer applies its activations, these activations are sent to the next hidden layer, and each successive layer's activations are sent through the layers to finally produce the output. Each hidden layer has its own weights and bias. For this, every layer behavesindependently and, unless they have same weights and bias, these hidden layers cannot be combined withone another layer. So, a recurrent neuron stores the state of aprevious input and combines it with the current input, thereby preserving some relationship of the currentinput with the previous input design for each data in X:

The stock price data downloaded must undergo comprehensive pre-processing and uniform normalization to ensure it is scaled consistently across the entire dataset.

$$x_{i,j} = \frac{(x_{i,j} - x_{.\min(axis=j)})}{x_{.\max(axis=j)} - x_{.\min(axis=j)}} \cdot (max - min) + min$$

Data preprocessing. For the input data matrix X, for

V. IMPLEMENTATION

This model is based on Machine Leaning Concept likeLSTM and various Phyton Libraries like Npm, pandas,Sequential, Dense, Layout and LSTM have been used in order to provide better UI and UX.

Early project implementation is mentioned below:

- Collect Google and Tesla historical stock pricedata, including opening price, closing price,high, low, and volume.
- Preprocess the data.
- Model Selection and Development.
- Training and Evaluation.
- Model Testing.
- Visualization and Interpretation.

V.2 Minimum Requirement Specifications

The implementation of this project of done in thesystem with following specifications and software.

Hardware:

- Processor: Pentium IV 2.4 GHz
- Hard disk: 60 GB
- RAM: 1 GB
- Monitor: 15’’ Colour
- CD Drive: LG52X
- Keyboard: Logitech 110 Keys
- Mouse: Logitech Mouse

Software:

- Operating System: Windows 7
- Coding: Visual Studio Code
- Browser: Microsoft Internet Explorer

Environment: Node.Js

Programming Language used:

- Python
- Packages used: npm, pandas, Sequential, Dense,Layout and LSTM

Early Version of Project:

```
            Date         Open         High          Low        Close  \
0     2013-01-02   357.385559   361.151062   355.959839   359.288177
1     2013-01-03   360.122742   363.600128   358.031342   359.496826
2     2013-01-04   362.313507   368.339294   361.488861   366.600616
3     2013-01-07   365.348755   367.301056   362.929504   365.001007
4     2013-01-08   365.393463   365.771027   359.874359   364.280701
...          ...          ...          ...          ...          ...
1254  2017-12-22  1061.109985  1064.199951  1059.439941  1060.119995
1255  2017-12-26  1058.069946  1060.119995  1050.199951  1056.739990
1256  2017-12-27  1057.390015  1058.369995  1048.050049  1049.369995
1257  2017-12-28  1051.599976  1054.750000  1044.770020  1048.140015
1258  2017-12-29  1046.719971  1049.699951  1044.900024  1046.400024

        Adj Close   Volume
0      359.288177  5115500
1      359.496826  4666500
2      366.600616  5562800
3      365.001007  3332900
4      364.280701  3373900
...           ...      ...
1254  1060.119995   755100
1255  1056.739990   760600
1256  1049.369995  1271900
1257  1048.140015   837100
1258  1046.400024   887500

[1259 rows x 7 columns]
```

Fig 1. Google Historical Data

```
In [2]: data=pd.read_csv("C:/Users/HP/TSLA.csv")

In [3]: data.head()

Out[3]:
```

	Date	Open	High	Low	Close	Adj Close	Volume
0	2010-06-29	19.000000	25.00	17.540001	23.889999	23.889999	18766300
1	2010-06-30	25.790001	30.42	23.299999	23.830000	23.830000	17187100
2	2010-07-01	25.000000	25.92	20.270000	21.959999	21.959999	8218800
3	2010-07-02	23.000000	23.10	18.709999	19.200001	19.200001	5139800
4	2010-07-06	20.000000	20.00	15.830000	16.110001	16.110001	6866900

Fig 2. Tesla Historical Data

```
[3]: trainset = df.iloc[:,1:2].values
[20]: dataset_test =pd.read_csv("C:/Users/HP/testset.csv")
[4]: trainset
```

Fig 3. Train set, Test set for Google stocks

```
In [20]: tesla_data[0:5]

Out[20]: array([[23.889999],
                [23.83    ],
                [21.959999],
                [19.200001],
                [16.110001]])

In [21]: tesla_data=tesla_data.astype("float32")

In [22]: def split_data(dataframe,test_size):
             pos=int(round(len(dataframe)*(1-test_size)))
             train=dataframe[:pos]
             test=dataframe[pos:]
             return train,test,pos

In [23]: train,test,pos=split_data(tesla_data,0.20)

In [24]: print(train.shape,test.shape)

         (1933, 1) (483, 1)
```

Fig 4. Train set, Test set for Tesla stocks

```
[11]: from keras.models import Sequential
      from keras.layers import Dense
      from keras.layers import LSTM
      from keras.layers import Dropout

[12]: regressor = Sequential()
      regressor.add(LSTM(units = 50,return_sequences = True,input_shape = (x_train.shape[1],1)))

[13]: regressor.add(Dropout(0.2))

[14]: regressor.add(LSTM(units = 50,return_sequences = True))
      regressor.add(Dropout(0.2))

[15]: regressor.add(LSTM(units = 50,return_sequences = True))
      regressor.add(Dropout(0.2))

[16]: regressor.add(LSTM(units = 50))
      regressor.add(Dropout(0.2))

[17]: regressor.add(Dense(units = 1))
```

Fig. 5 Implementing LSTM and defining model structure

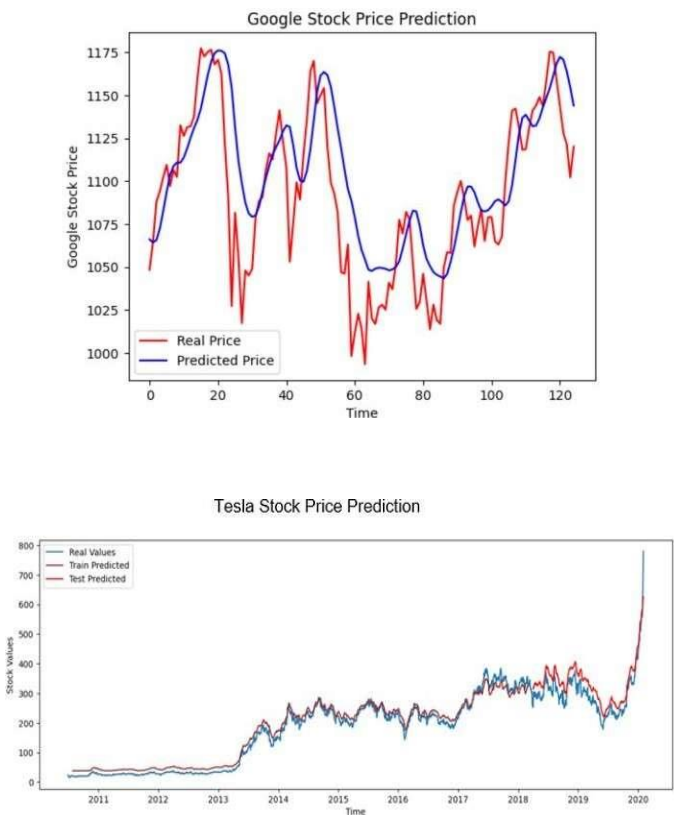

Fig 6. Visualizing the predictions

VI. FUTURE SCOPE

To further improve the performance of RNN-based stock price prediction, future research could explore incorporating additional data sources, such as news sentiment neural network architectures, such as attention mechanisms and Transformer models, could also be investigated. Additional features like moving averages and relative strength index (RSI) contributed to the model's performance by providing more information for prediction. Future work could alsoinvolve incorporating sentiment analysis of news related to these companies, considering global economic indicators, or exploring other deep learning architectures for improved accuracy.

VII. RESULTS AND DISCUSSIOSN

Even though there are many models already available in the market which serve the similar purpose of Predicting the Stock Price, this model will be providingsome more Efficiency on the top which have not been implemented yet or have been poorly implemented in the past. By combining experience from the past and knowledge from the present we have proposed an ideafor this model which has the potential of predicting theGoogle as well as Tesla stock price. This feature will not only provide investors to see the prediction for stock prices but also for Beginners it will be a great model to see for predicting market share Price.

VIII.CONCLUSION

In conclusion, this project successfully developed an RNN-based model for Google stock price prediction that met the predefined performance criteria. However, it is essential to acknowledge that stock price prediction remains a complex and challenging task with many external variables that influence market movements butalthough we have developed a prediction model for google price stocks.

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