

random layers of LSTM, GRU, SimpleRNN and all random numbers of epochs, layers, batch size and it will train itself until it reaches under the defined threshold limit, which is set 10 here.

The parallel models file which will use the dynamic model and train for each indicator in 1 file.

The final program will execute as given below steps.

Upon execution of the program it will give you option of stocks whichever are present in the Nifty 50

```
*****
List of available tickers
*****
1 KOTAKBANK.NS
2 RELIANCE.NS
3 BAJAJ-AUTO.NS
4 TITAN.NS
5 COALINDIA.NS
6 HINDALCO.NS
7 TATASTEEL.NS
8 ULTRACEMCO.NS
9 NTPC.NS
10 BRITANNIA.NS
11 ITC.NS
12 HEROMOTOCO.NS
13 GAIL.NS
14 TECHM.NS
15 WIPRO.NS
16 MARUTI.NS
17 SHREECEM.NS
18 NESTLEIND.NS
19 ONGC.NS
20 BAJFINANCE.NS
21 ICICIBANK.NS
22 ZEEL.NS
23 TCS.NS
24 INDUSINDBK.NS
25 LT.NS
26 M&M.NS
27 BHARTIARTL.NS
28 CIPLA.NS
29 BAJAJFINSV.NS
30 HCLTECH.NS

31 GRASIM.NS
32 ADANIPORTS.NS
33 EICHERMOT.NS
34 JSWSTEEL.NS
35 INFY.NS
36 SBIN.NS
37 AXISBANK.NS
38 IOC.NS
39 DRREDDY.NS
40 HINDUNILVR.NS
41 SUNPHARMA.NS
42 POWERGRID.NS
43 ASIANPAINT.NS
44 BPCL.NS
45 UPL.NS
46 TATAMOTORS.NS
47 HDFCBANK.NS
48 HDFC.NS
49 exit
*****
```

Fig. 4(p) List of all tickers shown.

After the stocks list are obtained it will ask for what ticker you would like to select, after entering the number of the ticker it will show you message which ticker you have selected.

```

*****
Select the stock: 36
*****

*****
Ticker selected is SBIN.NS
*****

```

Fig. 4(q) Ticker selected

After the stock is selected it will create a directory named “@temp” in the current working directory of program. This @temp directory is just created to download the saved model of the stock. This @temp would have a one more directory which would be named as the ticker’s name. This ticker named folder will save the stock specific model, all 19 models 1 is main model and all 18 others are the indicator specific models

```

> This PC > Local Disk (C:) > Users > Shivam > @temp > SBIN.NS

```

Fig. 4(r) creation of “@temp” folder and stock named folder.

After the ticker is selected the program will download the stock’s historical data of specified period which is set as 730 days or last 2 years. The interval of this historical data is that of 1 hour. After the data is downloaded it will give the output of the performance of the stock. It will show what is the difference in the price of the stock price over the period of the data.

```

*****
The Past Performance of the stock is:
Percentage change in last 2 years is 44.736%
*****

```

Fig. 4(s) Performance of the stock.

After the performance of the stock is shown it will start creating the indicator values and create a file in form of csv which will consist of the closing price, high, low, open and columns which will have indicator values. This file would consist of 27 columns and using this all the model would predict the next possible price.

After the data is created the program will next download the pretrained model of the selected stock. This process first checks if the folder of the ticker exists in the user directory, if it exists than are there models already present in directory, if models are present than it won’t download any models otherwise it would download the zip file of model from the drive which consist of 19 models.

```

*****
Downloading 1IzRfGt5XfjAe3y-JJSqIMmHb99Uzrnve into C:\Users\Shivam\@temp\SBIN.NS\SBIN.NS.zip... Done.
Unzipping...Done.
*****

```

Fig. 4(t) Downloading the stock specific model from drive.























PC > Local Disk (C:) > Users > Shivam > @temp > SBIN.NS				
Name	Date modified	Type	Size	
 20_EMA.h5	4/7/2021 7:27 AM	H5 File	90 KB	
 20_SMA.h5	4/7/2021 7:27 AM	H5 File	121 KB	
 50_EMA.h5	4/7/2021 7:27 AM	H5 File	83 KB	
 50_SMA.h5	4/7/2021 7:27 AM	H5 File	157 KB	
 100_EMA.h5	4/7/2021 7:27 AM	H5 File	169 KB	
 100_SMA.h5	4/7/2021 7:27 AM	H5 File	158 KB	
 200_EMA.h5	4/7/2021 7:27 AM	H5 File	207 KB	
 200_SMA.h5	4/7/2021 7:27 AM	H5 File	153 KB	
 ADX.h5	4/7/2021 7:27 AM	H5 File	139 KB	
 ATR.h5	4/7/2021 7:27 AM	H5 File	198 KB	
 Bollinger.h5	4/7/2021 7:27 AM	H5 File	339 KB	
 CCI.h5	4/7/2021 7:27 AM	H5 File	121 KB	
 FibRetr.h5	4/7/2021 7:27 AM	H5 File	212 KB	
 Ichimoku.h5	4/7/2021 7:27 AM	H5 File	560 KB	
 MACD.h5	4/7/2021 7:27 AM	H5 File	209 KB	
 PSAR.h5	4/7/2021 7:27 AM	H5 File	186 KB	
 RSI.h5	4/7/2021 7:27 AM	H5 File	98 KB	
 SBIN.h5	4/7/2021 7:27 AM	H5 File	1,357 KB	
 SBIN.NS.zip	4/7/2021 7:27 AM	WinRAR ZIP archive	1,722 KB	
 SBIN_all.csv	4/7/2021 7:26 AM	Microsoft Excel Com...	429 KB	
 SBIN_all_indicator.csv	4/7/2021 7:26 AM	Microsoft Excel Com...	2,271 KB	
 StoOsc.h5	4/7/2021 7:27 AM	H5 File	123 KB	

Fig. 4(u) Model downloaded and unzipped and saved in the working directory.

The next process it follows is, it will get the main model of the stock which predicts price using all 12 indicators combined. It will use the model and show us the metrics of the model i.e. average error of the model, error percentage, projected error percentage, final profit percentage and trade error of the model.

```

*****
The Model Metrics

Average error: [4.752816]
Error percentage: [1.3323445]
Projected profit percentage: [1.3848408]
Final profit percentage: 0.5636523954016742
Trade error %: [1.0551528]
*****

```

Fig. 4(v) The metrics of the model.

Furthermore, in the program next it would perform the benchmarking of the model which predicts the price with the Nifty index. It would compare the last 10% day intervals and would find how much returns nifty would have given you over that period and how much return our model would have given to us if our model would have been used to predict the prices.

```

*****
The Model compared with NSE Index

The projected profit in 487 interval is (%)      674.4174920320511
The Final profit in 487 interval is (%)          274.4987165606153
The error percentage in 487 interval is (%)       648.8518
Nifty return of 487 interval is (%)              7.264003244650772
SBIN return of 487 interval is (%)               31.144782567098144
*****

```

Fig. 4(w) Comparison to Nifty index.

Here if we would have invested in Nifty 487 intervals back, then after this duration we would have gained 7.26% profit, while if our model would strategy would have been used then in the same duration we would have the profit percentage increased by 4 times and reach to 31.14%.

Next the program will give the next interval predicted price of the stock as the output.

```

*****
The predicted value for next Interval is [[350.95816]]
*****

```

Fig. 4(x) Next interval price predicted.

The next strategy we thought was to strengthen our model's confidence by predicting the price of the next interval using all the indicators separately. So next output of the program is to predict the prices according to each indicator. The output would consist the next interval projected price, the difference between the last interval and next possible interval price and the 3<sup>rd</sup> column would consist of the indication whether to buy or sell the stock in the next interval.



```

*****
The prices predicted parallelly from the indicator models is:
-----
Prediction  Difference  Indication
-----
mainModelPrice  [[350.96]]  [[-0.44]]  Sell
sma20ModelPrice  [[348.51]]  [[-2.89]]  Sell
sma50ModelPrice  [[350.67]]  [[-0.73]]  Sell
sma100ModelPrice  [[359.42]]  [[8.02]]  Buy
sma200ModelPrice  [[334.57]]  [[-16.83]]  Sell
ema20ModelPrice  [[350.55]]  [[-0.85]]  Sell
ema50ModelPrice  [[359.74]]  [[8.34]]  Buy
ema100ModelPrice  [[360.15]]  [[8.75]]  Buy
ema200ModelPrice  [[349.42]]  [[-1.98]]  Sell
stoOscModelPrice  [[351.97]]  [[0.57]]  Buy
macdModelPrice  [[349.64]]  [[-1.76]]  Sell
bolBandsModelPrice  [[347.88]]  [[-3.52]]  Sell
rsiModelPrice  [[351.17]]  [[-0.23]]  Sell
atrModelPrice  [[346.81]]  [[-4.59]]  Sell
cciModelPrice  [[344.1]]  [[-7.3]]  Sell
ichimokuPrice  [[350.72]]  [[-0.68]]  Sell
adxModelPrice  [[351.44]]  [[0.04]]  Buy
fibRetrModelPrice  [[350.23]]  [[-1.17]]  Sell
psarModelPrice  [[355.56]]  [[4.16]]  Buy
*****

```

Fig. 4(y) Prices predicted using the models separately.

Based on the previous part of the program the program will perform next operation which is to how much confidence the model has on buying or selling the stock based on the prices predicted by the indicator models.

```

*****
The Buy and Sell Confidence on the stock using Parallel models is
Buy Confidence: 31.58%
Sell Confidence: 68.42%
*****

```

Fig. 4(z) Buy and Sell confidence of the model.

Next after completing the buy and sell metrics it would calculate the trade success percentage, it shows if you would have used and traded according to the model for last 10% of data, how much percentage of trades would have gone your way.

```

*****
Trade Success Percentage
Trade Success Percentage(for last 10% data): 64.07%
*****

```

Fig. 4(aa) Trade success percentage summary.

After completing all the above processes the next part is about the sentiment analysis of the stock. It would give how is the current situation of stocks in news, whether it is positive, negative or neutral. The program will obtain general news and stock specific news, it will return the latest

news from Google, GoogleNews and Moneycontrol website. After news headline is obtained the program would next obtain whole article and summary of the article and after all the data is obtained using the natural language processing the sentiment analysis of the latest news is obtained and program returns the average of the polarity score (factor on which we determine whether it's positive or negative or neutral) for general news and stock specific news.

```
*****
Sentiment analysis of current stock is:
Scope:
(-1.0 to -0.2) : Negative
(-0.2 to +0.2) : Neutral
(+0.2 to +1.0) : Positive

Average Sentiment of general news is: 0.402
Average Sentiment of Specific news is: 0.245
*****
```

Fig. 4(ab) Sentiment analysis of news of the current stock(SBI).

Additional to this program we also created 2 more programs which we are planning to integrate in future, this programs are the more refined version of the indicator strategies. One program uses the moving average, it is more refined strategy which uses the “Golden cross” and “Death cross” strategy and would give more confident direction of the stock price which way it might go, it uses the simple moving average and exponential moving average. Another program uses the stochastic oscillator indicator and performs same type of the operation.