January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

Performance Analysis of Stock Prediction by PLANN Techniques

G. Sundar
Research Scholar, Bharath University, Chennai

Dr. K. Satyanarayana
Research Supervisor, Bharath University, Chennai.Principal & Prof, Dept. of Computer Science, Sindhi College, Chennai

Article Info
Volume 82
Page Number: 6303 - 6313
Publication Issue:
January-February 2020

Article History
Article Received*: 18 May 2019*
Revised*: 14 July 2019*
Accepted*: 22 December 2019*
Publication*: 30 January 2020*

Abstract:
This performance analysis advances in choosing modeling which includes optimization of product model, inverse model , fault detection ,fault diagnostics and modeling optimization of engineering sciences and technologies.This study provides a modeling and optimization of human conscientiousness environment by renewable energy saving. The energy savings is done by optimizing the future stock price detection and diagnostics. The analysis leads to innovative energy savings in stock market. The stock market price prediction is necessary for getting profit and investment. The stock market is affected by various attributes like economic, political and human. Even though, many intelligent networks are available to predict the price, there is a need for new prediction technique to optimize the stock index price and make green engineering technology solution in stock price. Artificial Neural Network(ANN) helps the better prediction to forecast the closing stock price. This study use the neural network model to train and forecast the stock market price in order to help the investors to choose better time for buying or selling the stock.

Keywords: *Stock market, Pattern Learning Artificial Neural Network (PLANN), Green Engineering Technology, Decision Tree, M5 Rule, ZeroR, InputMappedClassifier, Bagging, Random Classification, Stacking*.

I. INTRODUCTION:

Predicting future price prior will save the stimulation of performance of innovative energy supply systems including renewable energies. This performance model optimizes the human environment by saving the tools used for applications. The analysis is mainly used to promote environmentally safe engineering by considering the utilization of the various modeling approaches. The department of stock market index denotes association of price value or propensity of uncertainty in stock market for the forthcoming. Predicting the link is a practical issue, which influence financial trader's choice to buy or sell a stock. Accurate forecast of the trends of stock price index can be extremely advantages for the investors. Trading could be made cost effective by an accurate prediction of the direction of movement of the stock index. It is very important for stack holders even though the stock market behavior depend on the quality attributes like economical, natural, and political, etc. Stock markets are dynamics and the prediction is a highly challenging task because of complex dimensionality. The main objectivity of this paper is to advance the prediction accuracy of the prediction of the stock price index by using ANN model to advances in modeling and includes optimization in green engineering technology. We focus on stock market

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

variables for forecasting the future trends. This study will also compare the ANN algorithms likeBagging, ZeroR, Stacking, Input Mapped Classifier and Decision Tree.This helps to novelty the enactmentexplorationwhich progresses in choosing modeling which includes optimization of product model, inverse model, fault detection,fault diagnostics and modeling optimization of engineering sciences and technologies.

II. BACKGROUND:

Stock market is a public entity for the trading of company stock/shares at an agreed price. It is a more important source for a company to raise money. People invest in stock market based on various investors' response attitude for share and company's performance and profitability. Investors may themselves familiar with the company by comparing the growth and prospect related to current economic environment, but it is very difficult to normalize the analysis for stock market knowledge interpretation.

Stock market is often divided into 12 sectors with each sector having unique change, which affect its profitability. The sectors are Banking, Finance, Utilities, Consumer discretionary, Consumer staples, Energy, Healthcare, Industries, Technology, Telecom, Materials, and Real Estate. Current stock market sector of BSE (Bombay Stock Exchange) is described in the below diagram-1.

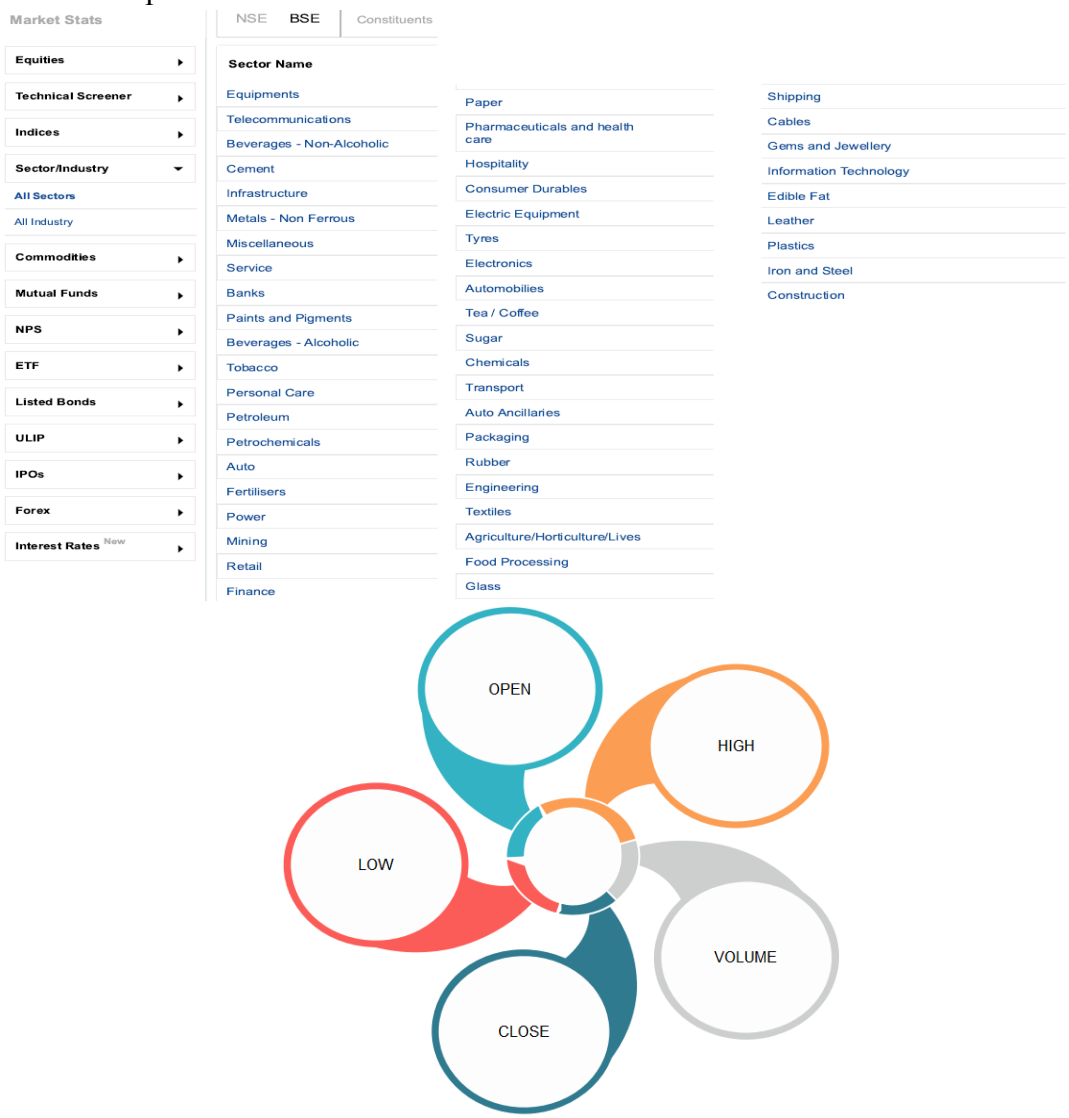

Diagram 1. BSE stock market sectors

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

Stock market values varies based on strategies like demand and supply. Stock market is widely used investment scheme which promise high returns, but having high risk. It is possible to predict the stock by reading news from the Internet and also historical data about the stock, but there are some factors which influence the stock market. The factors are word events, economy, scandals, company news, hype, politics, supply and demand, natural disaster, expectation and speculation, and war and terrorism.

2.2 ARTIFICIAL NEURAL NETWORK (ANN)

Artificial neural networks are modeled using human brain architecture. It is used to form complex networks as a simple processing units. Each unit is represented as a node. A node is a simplified model of neuron which is used to form a wired network. A neuron fires and receives a signal from the other connected nodes in a network. An Artificial neural network is used to form a novel structure of intelligence system. It has interconnected neurons to find optimized result of a problem specified.

Feed forward network is one of popular ANN method in which the output of any layer does not affect the same layers. It always deals with inputs and outputs. It use pattern learning form to find solution from data. Multilayer perceptions of feed forward networks are very popular prediction method due to its ability to data learning using patterns. The various learning methods are described in Section 5.

To improve the existing predictive models of stock price researchers always make talent plan in development. Stock market price prediction regards not an easy work to achieve. Many investors need prediction method, which minimize the risk factor in market investment. This is achieved by using the learning method comparison.

III. RELATED WORK:

Many researches have been done on stock market predictions. All researchers have different pattern selection model based on various techniques. Stock market price prediction done by considering the parameters like closing price, turnover, global indices, currency rate, according to Amit Ganatr and Y.P. Kosta (2010) [1].

According to AdebiyiAyodele A, et al., (2012) the hybridization of technical and fundamental analysis of stock market index is necessary for predicting of pattern price of stock in order to improve the existing approach [2].

Neural network tool gives a promising direction of study of prediction of markets and other economic time series [3].

Stock market prediction is utilized in decision making for the customer finalizing whether to buy or sell a particular share of a stock. Set by Mayan Kumar B. Patel, et al., (2014) [4].

Common market analysis technique such as technical analysis, fundamental analysis, and regression are compared with neural network by Ramon Lawrence [5] to forecast stock market price. Also he defined a hypothesis known as Efficient Market Hypothesis (EMH). He compared EMH with chaos theory and neural network. He discovers the ability to maintain patterns in nonlinear and chaotic system. He says neural networks offer the ability to predict the stock market prediction more accurately than other techniques.

The research work presents the stock price trend is a complex nonlinear function and need improved ANN model like BP Neural Networks to setup the stock market prediction with good effect for investment.

By back propagation artificial neural network and multiple linear regression approach [6] Yao YevenyoZiggah, et al., (2016) have interviews statistical approach finding stock prediction using Cartesian coordinates.

IV. LEARNING METHOD

4.1 Bagging

Bagging is the bootstrap aggregation used to reduce variants in model. It uses multiple bootstrap samples of data. Consider there are 'X' containing 'Y'

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

Training set then the probability using in the instance is (Y - 1) / Y.

4.2 Random Classification

It is used to create a set of decision tree from a given training set and then it decide the final test object. Select the best split point 'S'of 'n' number of trees from the available pattern set say 'Y' select 'X' patterns such that X <Y. Repeat the steps to build a forest with 'n' number of trees.

4.3 Stacking

It is used to ensemble a new model from training the previous combined prediction models. It uses sequential layer as input of the model to form new combined set of prediction. Consider the training set T= {xi, yi} construct new data set of predictions P= {xi',yi} where xi'= {set of heterogenous learn base-level classifier}

4.4 Decision Tree

It partition the input space as mutual region with labels and characterize its data point. It is a tree structure as internal and external node of branches. It is used to find the gain of classification.

It uses the formula to define the uncertainty of a random variable X by entropy.

4.5 ZeroRClassifier

It is used to predict the majority class as the target predictor. It is useful for determining a baseline performance. It constructs a frequency table for target value and select the most frequent value as the prediction result.

4.6 Input Mapped Classifier

This method is used to addresses incompatible training and test data by using the mapping between the training data set. This classifier can be trained or an existing one loaded from a file. This method built with the incoming instances to classify the attribute values.

4.7 M5 Rules

It is used to generate a list for the problems using separate and conquer method. In each iteration it build a model tree using M5 to make the best leaf as a rule.

V. PROPAGATION RULEUSED IN LEARNING METHODS

The classification accuracy measure on a given set is defined by using the common rule 'Y '. It is defined in equation 1. It is used to combine all input to the output.

$$Y = \sum (\text{weight} * \text{input}) + \text{Bias} \quad \text{-------- (1)}$$

The above equation is used for predicting values from historical input data.

VI. PATTERN LEARNING METHODOLOGY

The pattern learning is described by using the propagation rule. This methodology mainly used for predicting values from historical input data. The Pattern learning methodology is described in the diagram 2. It stimulates the process and produces the desired response according to the data. It is also used to classify the result based on patterns. In training process the neuron receives many different input patterns and organizes the pattern according to its category. Then it provides the output as response.

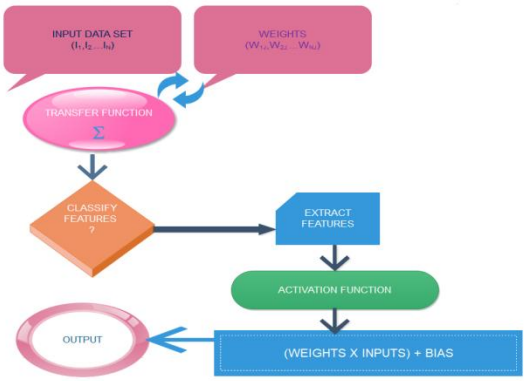

Diagram 2 Pattern Learning Simulation Methodology.

Historical input and output training patterns are repeatedly passed to a network. Each time an input pattern is passed and the output value is multiplied by its weight to arrive the input for next neuron. In

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

hidden and output layers each neurons output is determined by sum of its input and its sigmoid transfer function. A model is developed using a multilayer neural network with an appropriate learning algorithm.

VII. EXPERIMENT AND RESULTS

The experiment used here follows the procedural steps from (a) to (c).

a) Collect the historical data and select the attributes need for the classifier.

b) Apply the learning methods.

c) For each data do

Perform the classification and collect the rules and patterns

Choose Merit of best subset found.

Choose Evaluation for pattern selection.

Choose Time taken for model built, test model on training data, Correlation.

Choose Error values for Mean Absolute, Root Mean Squares, RelativeAbsoluteand Root Relative Absolute.

End for.

The stock prediction system methodology is used in this paper first selects a module and then patterns selects are selected by using pattern learning methods. A random set of historical input classification is done to predict next day closing price using chosen dataset. In this study, the prediction of future system is validated using BSE (Bombay Stock Exchange Data). Each learning methods are applied and the total number of rules are observed in table 1. The best pattern sets corresponding to the classification is also listed in the table.

Table 1 Pattern set formation using various learning classifier methods

S. No	Classifier Name	Attributes used	Instances	Number of Rules	Search direction	Pattern set
1.	Decision Tree	Date, Open, High, Low, Close, Volume	251	39	forward	2,3,4,6
2.	M5Rules	Date, Open, High, Low, Close, Volume	251	11	forward	2,3,4,5
3.	ZeroR	Date, Open, High, Low, Close, Volume	251	1	forward	2,3,4
4.	InputMappedClassifier	Date, Open, High, Low, Close, Volume	251	2	forward	2,3,4
5.	Bagging	Date, Open, High, Low, Close, Volume	251	11	backward	2,3,4,5
6.	Random Classifications	Date, Open, High, Low, Close, Volume	251	121	forward	2,3,4
7.	Stacking	Date, Open, High, Low, Close, Volume	251	27	forward	2,3,4

Table 2 Performance of PLANN with Merit of best subset found

S. No	Classifier Name	Total number of subsets evaluated	Merit of best subset found	Evaluation (for pattern selection)

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

1.	Decision Tree	5	12489168.499	cv
2.	M5Rules	2	6212402.5002	M 4.0
3.	ZeroR	3	2.508807584860 5577E7	ZeroR
4.	InputMappedClassifier	2	2.508807584860 5577E7	ZeroR
5.	Bagging	5	10.001	REPTree
6.	Random Classifications	3	6.808673005654 992E-10	
7.	Stacking	3	2.508807584860 5577E7	X 10 -M

Each learning methods are applied and Merit of best subset is found for total number of subsets to be evaluated. According to table 2 ZeroR, InputMappedClassifier and Stacking shows less merits which is used to select the patterns for the dataset.

The correlation coefficient is the degree in which the change in a set of variables is related. The correlation values should be between -1 and +1. The closer the number is positive, the stronger the positive correlation. The closer the number is negative, the stronger the negative correlation. The number is to 0 shows the weaker correlation. 0 means there is no correlation between the variables. The correlation coefficient equation Pearson 'r' is defined in the below equation 2.

$$r = \frac{n(\sum pq) - (\sum p)(\sum q)}{\sqrt{(n\sum p^2 - (\sum p)^2)(n\sum q^2 - (\sum q)^2)}}$$

Correlation is the ratio between correct and assumed category value. Time taken to build model and test model are also calculated. The lowest value of time indicates the best classifier for correct value prediction.Table 3 describes the correlation values for the classifiers such as Decision Tree, M5Rules, ZeroR, InputMappedClassifier, Bagging, Random Classifications and Stacking are measured for error value. We applied R tool for the calculation. In the table we have the correlation value is 0 for ZeroR, InputMappedClassifier and Stacking. It means these three classifier will shows best result of pattern for the stock prediction.

Table 3 Performance of learning methods with time mode based on built and test on Correlation Coefficient

S. No.	Classifier Name	Time taken to build model	Time taken to test model on training data	Correlation Coefficient
1.	Decision Tree	0.06 Seconds	0.02 Seconds	0.6835
2.	M5Rules	0.59 Seconds	0.02 Seconds	0.9965
3.	ZeroR	0 Seconds	0 Seconds	0
4.	InputMappedClassifier	0.02 Seconds	0.05 Seconds	0
5.	Bagging	0.11 Seconds	0.01 Seconds	0.9778
6.	Random Classifications	0.05 Seconds	0 Seconds	0.8304
7.	Stacking	0 Seconds	0.02 Seconds	0

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

The comparative of performances based on different classifications such as Decision Tree, M5Rules, ZeroR, InputMappedClassifier, Bagging, Random Classifications and Stacking are measured for error value. We employed R tool for the implementation of experiments. One year stock data from BSE was selected for the experiments. Error rate Classification is measured by Mean Absolute Error, Root Mean Squared Error,Relative Absolute Error and Root Relative Squared Error.

Table 4 Performance of different error values based on PLANN

S. No.	Classifier Name	Error Value			
		Mean Absolute	**Root Mean Squared**	**Relative Absolute**	**Root Relative Squared**
1.	Decision Tree	5916256.9615	10367571.6493	62.0566 %	72.9937 %
2.	M5Rules	514748.505	1181836.0984	5.3993 %	8.3208 %
3.	ZeroR	8894825.6639	12611927.2576	100 %	100 %
4.	InputMappedClassifier	9533639.2997	14203374.9056	100 %	100 %
5.	Bagging	3585667.103	5696185.9437	37.6107 %	40.1045 %
6.	Random Classifications	5897296.467	7928039.6412	61.8578 %	55.818 %
7.	Stacking	9533639.2997	14203374.9056	100 %	100 %

VIII. OUTPUT STUDY

Table 1,2,3 and 4 shows the results of the experiment done. The parameters like merit of best subset, evaluation of pattern selection, time taken to build model, test model on training data, correlation coefficient and error values were selected for comparison. In order to compare selected pattern learning the pattern was taken for all datasets and results are shown in Diagram 3-8.

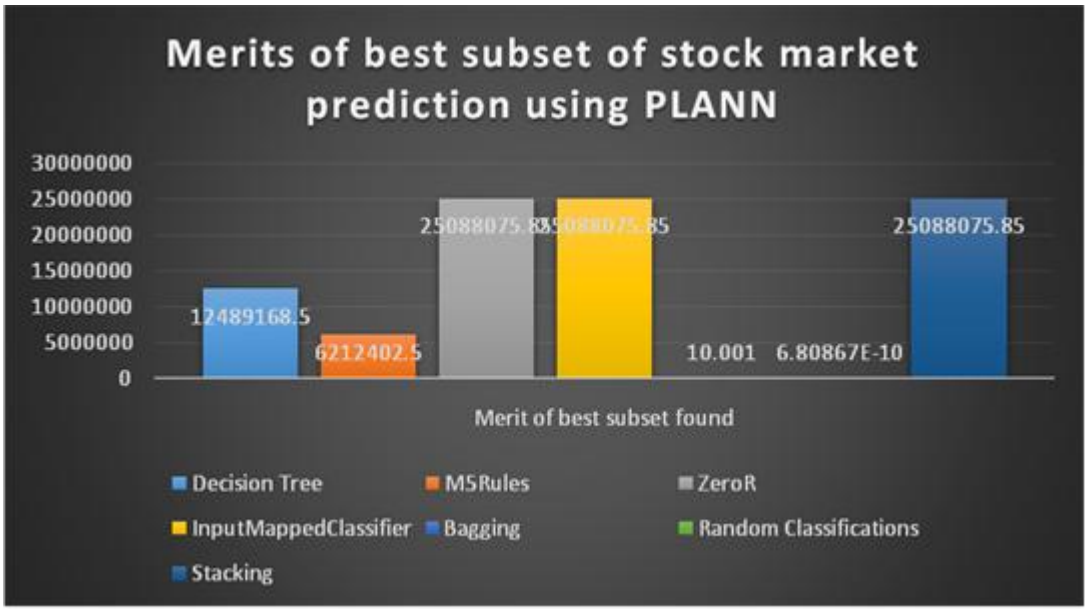

Diagram 3 Merits of best subset of stock market prediction using PLANN.

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

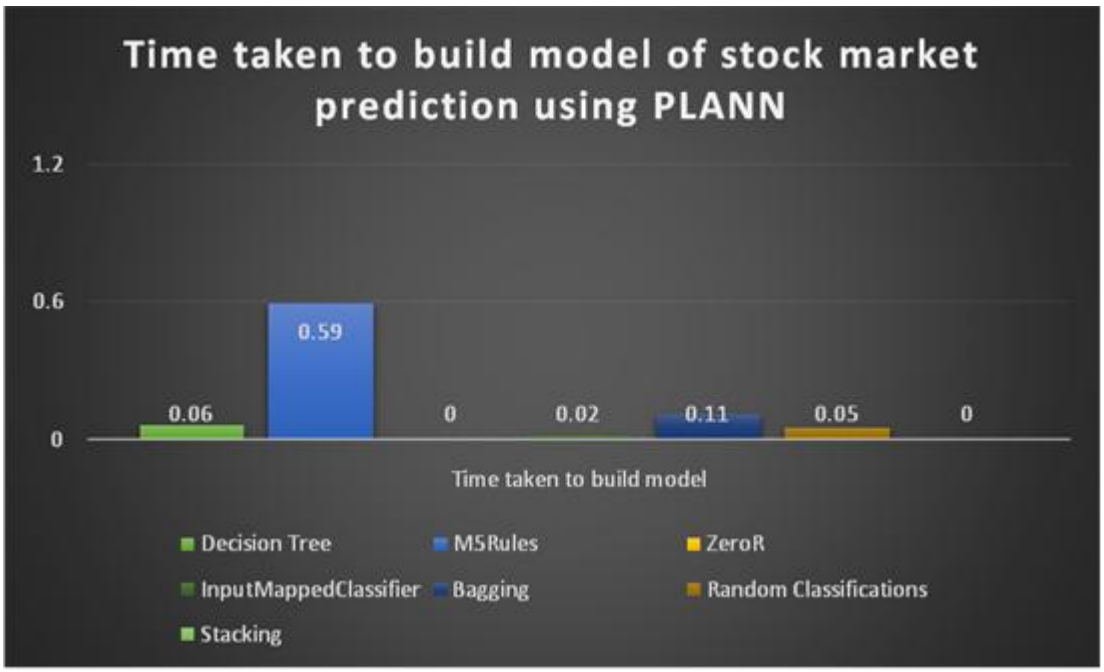

Diagram 4 Time taken to build model of stock market prediction using PLANN.

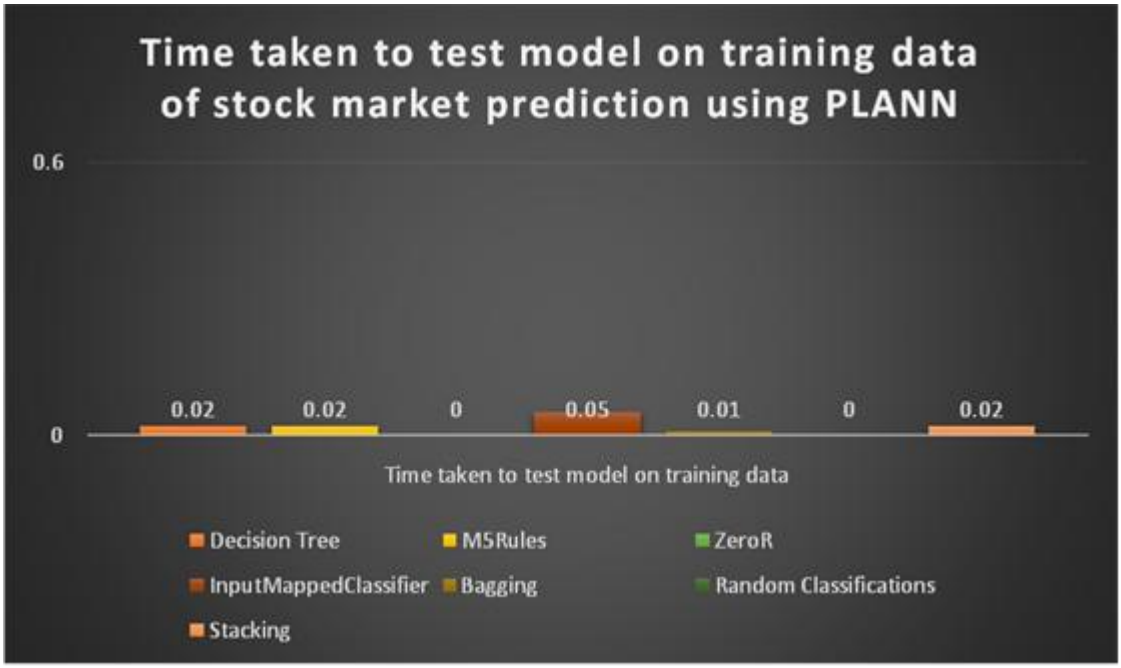

Diagram 5 Time taken to test model on training data of stock market prediction using PLANN.

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

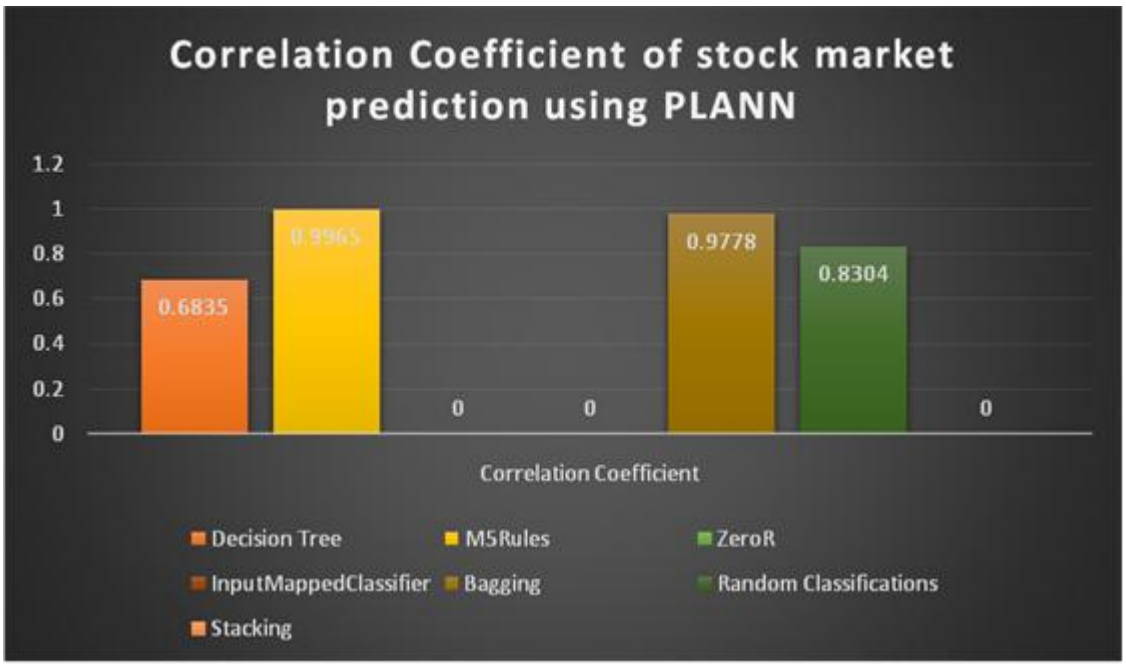

Diagram 6 Correlation Coefficient of stock market prediction using PLANN.

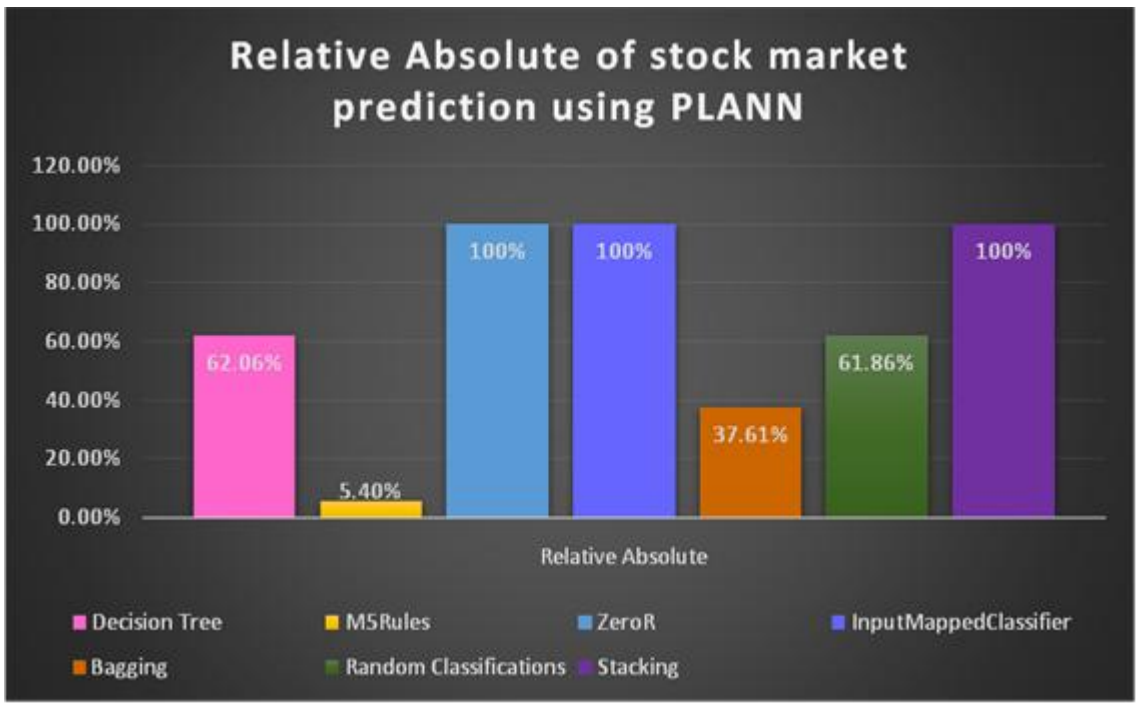

Diagram 7 Relative Absolute of stock market prediction using PLANN.

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

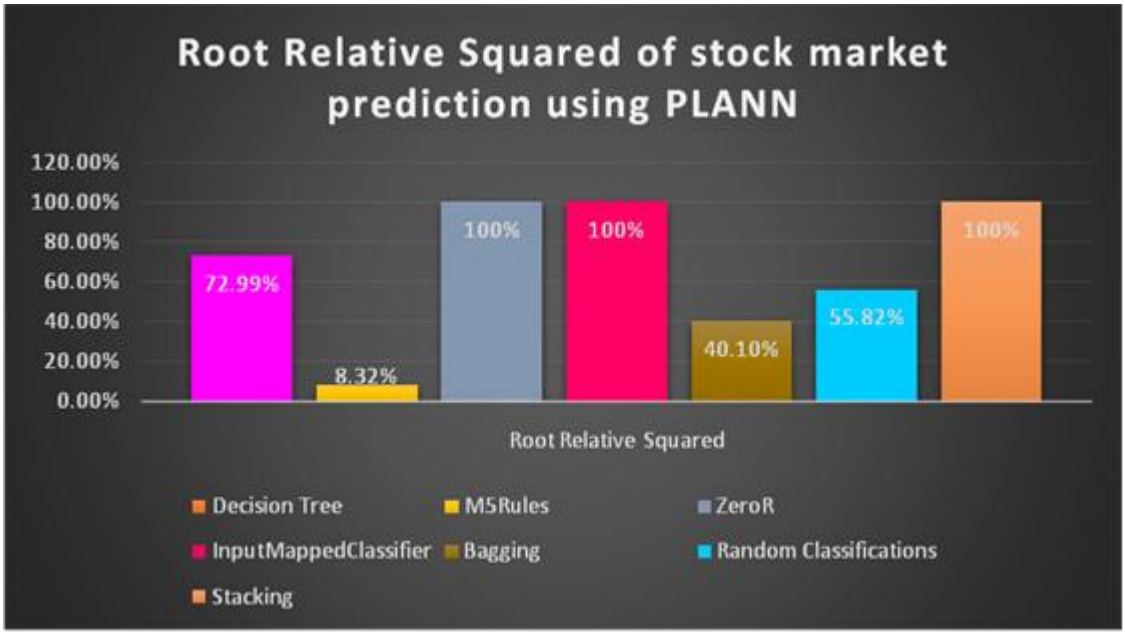

Diagram 8 Root Relative Squared of stock market prediction using PLANN.

Mean Absolute Error (MAE) is used to find the close value of prediction. It is an average of the absolute errors $|e_1|=|p_i - t_i|$, where p_i is the prediction, t_i is the true value and e_i is the error value. 'n' is the total number of pairs. It is described in equation 3.

$$Mean\ Absolute\ Error\ (MAE) = \frac{1}{n} + \sum_{i=1}^{n} | p_i - t_i | = \frac{1}{n} + \sum_{i=1}^{n} | e_i |$$

The relative mean squared error represents the sample of the differences between predicted values and observed values.The RMSE (Relative Mean Squared Error) of predicted values $\hat{y}_t$ for times t of a regression's dependent variable y is computed for n different predictions as the square root of the mean of the squares of the deviations. It is described in equation 4.

Relative Mean Squared Error (RMSD) = $\sqrt{\sum_{t=1}^{n} \frac{(\hat{y}_t - y)^2}{n}}$

The difference between relative and absolute error is how much the result is derived from the original value. If the measure is between 90 and 100 then the value is excellent. If the measure is between 80and90 then the value is good. If the measure is between 70 and 80 then the value is fair. If the measure is between 60 and 70 then the value is poor. If the measure is between 50 and 60 then the value is fail.

IX. CONCLUSION:

This enactment study spreads in choosing modeling which includes optimization of product model, inverse model, fault detection ,fault diagnostics and modeling optimization of engineering sciences and technologies. The absolute error value is taken as performance measure. The prediction was based on historical data collected from BSE.Based on above Table 4, we can see that highest accuracy is 100 which is occurred inZeroR, InputMappedClassifier and Stacking. The lowest accuracy is in M5Rules. Also the highest accuracy belongs to ZeroR, InputMappedClassifier and Stacking takes very short time compared to other classifier. By taking both pattern time and error values Stacking is the best PLANN classifier to classify the stock using historical data set which simulates the performances of innovative stock prediction and experiences green engineering technology in stock market.

This paper discusses about 7varieties of PLANN technique. The results of time, MSE and RMSD are used to measure the accuracy of PLANN so as to

January - February 2020
ISSN: 0193 - 4120 Page No. 6303 - 6313

find the best classifier to predict the future stock market price in BSE. By using this performance measure simulation tools for sustainable environment is formed to experience the environmentally safe engineering.

REFERENCES

1. Spiking Back Propagation Multilayer NeuralNetwork Design for Predicting UnpredictableStock Market Prices with Time Series Analysis, Amit Ganatr and Y. P. Kosta, International Journal of Computer Theory and Engineering, Vol.2, No.6, December, 20101793-8201
2. Stock Price Prediction using Neural Network with HybridizedMarket Indicators, AdebiyiAyodele A., Ayo Charles K., Adebiyi Marion O., and Otokiti Sunday O. VOL. 3, NO. 1, January 2012, ISSN 2079-8407, Journal of Emerging Trends in Computing and Information Sciences©2009-2011 CIS Journal
3. https://theclevermachine.wordpress.com/
4. Stock Price Prediction Using ArtificialNeural Network, Mayank Kumar B Patel, Sunil R Yalamalle International Journal of Innovative Research in Science,Engineering and Technology(An ISO 3297: 2007 Certified Organization)Vol. 3, Issue 6, June 2014
5. Using Neural Networks to Forecast Stock Market Prices, Ramon Lawrence, Department of Computer Science, University of Manitobaumlawren@cs.umanitoba.ca, December 12, 1997
6. Capability of Artificial Neural Network for ForwardConversion of Geodetic Coordinates (φ, λ, h)to Cartesian Coordinates (X, Y, Z), Yao YevenyoZiggah, • Hu Youjian, Xianyu Yu, • Laari Prosper Basommi, International Association for Mathematical Geosciences 2016
7. "Artificial Intelligence a Modern Approach" (second edition) by Stuart Russell, Peter Norvig, 2004
8. Adhikari R., and R. K. Agrawal. 2013. A Combination of Artificial Neural Network and Random Walk Models for Financial Time Series Forecasting. Neural Computing and Applications
9. Tiffany Hui-Kuangyu and Kun-Huang Huarng, "A Neural network-based fuzzy time series model to improve forecasting", Elsevier, 2010, pp: 3366-3372.
10. AkinwaleAdio T, Arogundade O.T and Adekoya Adebayo F, " Translated Nigeria stock market price using artificial neural network for effective prediction. Journal of theoretical and Applied Information technology , 2009.
11. David Enke and SuraphanThawornwong, "The use of data mining and neural networks for forecasting stock market returns, 2005.
12. Z.H. Khan, T.S. Alin and M.A. Hussain, "Price Prediction of Share Market using Artificial Neural Network (ANN)", International Journal of Computer Applications, 22, No 2, pp. 42-47, 2011.
13. H. Al-Qaheri, A. E. Haassanien, and A. Abraham, "Discovering stock price prediction rules using rough sets, Neural network world, vol 18, 181-198, 2008.
14. Bruce Vanstone & Gavin Finnie, [2009] "An empirical methodology for developing stock market trading systems using artificial neural networks, An international journal of expert systems with applications vol 36, issue 3, 6668-6680.
15. ZabirHaiderKhan,TasnimSharminAlin, Md. AkterHussain, " Price Prediction of Share Market using Artificial Neural Network (ANN)", International Journal of Computer Applications (0975 – 8887),Volume 22– No.2, May 2011
16. Deepak RanjanNayak, AmitavMahapatra,Pranati Mishra, "A Survey on Rainfall Prediction using Artificial Neural Network"
17. Satanand Mishra, Prince Gupta, S.K.Pandey,J.P.Shukla,"An Efficient Approach of Artificial Neural Network in un off Forecasting
18. V.G. Mutalik Desai, Veena Desai & D.H. Rao,"Prediction of Compression Index Using Artificial Neural Networks"
19. http://neuralnetworksanddeeplearning.com/chap2.html
20. http://www.codeproject.com/Articles/175777/Financial-predictor-via-neural-network
21. http://ijdmta.com/papers/vol2issue2/ijdmta/DEC_13_IJDMTA_010.pdf
22. http://www.researchgate.net/publication/228607056_Using_neural_networks_to_forecast_stock_market_prices
23. http://uonbi.academia.edu/WanjawaWB
24. http://www.ijcaonline.org/volume22/number2/pxc3873497.pdf
25. http://journal.seo.ir/page/download-GLgsPnnRG_A.artdl