

Stock-Market Data Inspection and Future-Stock Prediction using NN

¹ M. Aparna M. Tech

Asst.Prof. in Dept. Of CSE
Narasaraopet Engineering College

² M. Siva Naga Raju M. Tech

Asst.Prof. in Dept. Of CSE
Narasaraopet Engineering College

³ E. Ravindra Reddy M. Tech

Asst.Prof. in Dept. Of CSE
MPES Engineering College

⁴ K Narasimha Reddy M. Tech

Asst.Prof. in Dept. Of CSE
Narasaraopet Engineering College

Abstract— Share market is one in every of the foremost unpredictable and place of high interest within the world. There aren't any vital ways exist to predict the share value. Principally individuals use 3 ways like elementary analysis, applied math analysis and machine learning to predict the share value of share market however none of those ways are proved as a systematically acceptable prediction tool. Therefore developing a prediction tool is one in every of the difficult tasks as share value depends on several important issue and options. during this paper, we have a tendency to propose a sturdy technique to predict the share rate victimization Neural Network (NN) primarily based model and compare however it disagree with the particular value. For that we have a tendency to collect the share market information of last half dozen months of ten firms of various classes, cut back their high spatiality victimization Principal Component Analysis (PCA) in order that the Back-propagation Neural Network (NN) are able to train quicker and with efficiency and create a comparative analysis between Hyderabad exchange (HSE) algorithmic program and our technique for prediction of next day share value. so as to justify the effectiveness of the system, totally different check information of firms stock are wont to verify the system. we have a tendency to introduce a sturdy technique which may cut back the information spatiality and predict the worth supported artificial neural network.

Keywords—Artificial Neural Network, PCA, Stock Market, Stock Market Prediction, DSE

I. INTRODUCTION

Predicting something is that the most mysterious and toughest task in our world. sensible prediction makes things sensible and unhealthy prediction makes a large loss. stock exchange prediction is one in every of the toughest tasks for everybody United Nations agency deals with it. Prediction with one thousandth accuracy is kind of not possible. sensible prediction suggests that prediction with sensible average calculation. once some ones prediction is healthier at average, then he/she may be a sensible analyst. From the start of world it's been our common goal to form our life easier and comfy. The prevailing notion in society is that wealth brings comfort and luxury, there has been such a lot work done on ways that to predict the stock markets. Varied ways, techniques and ways that are projected and used with variable results. stock exchange prediction is to predict the longer term stock victimization the market statistics of past years. However, no technique or combination of techniques

has been productive enough to systematically "beat the market". In my analysis work I have got used neural network, because it is that the most powerful tool to predict and analyze knowledge. The conception of the neural network comes from the conception of our biological brain.

it's excellent at recognizing complicated pattern and discover the unknown relation among completely different variables of knowledge.

In this paper, we have a tendency to studied heap concerning the stock exchange statistics. we have a tendency to use Hyderabad stock market, People's Republic of Andhra Pradesh as our knowledge supply. we have a tendency to choose ten firms from completely different class and collect their last six months knowledge. This knowledge archive contains Brodningnagian quantity of knowledge with multiple dimensions. As a research worker we have a tendency to apply a applied mathematic tool Principal part Analysis referred to as PCA to scale back the information dimension. Reducing knowledge dimension is critical as a result of massive dataset needed longer to coach in Neural Network (NN). when reducing knowledge dimension we have a tendency to implement neural network to coach the information set and neural network notice the relation between completely different variables. when productive coaching we have a tendency to be able to check our network victimization existing knowledge however well it will predict victimization different plotting and victimization different diagram. we have a tendency to calculate the error rate and the way a lot of knowledge are foretold in quietly just about the first knowledge.

II. SYSTEM ARCHITECHTURE

Analysis of the large quantity of information of stock exchange is that the main challenge for United States as there is sizable amount of organizations and company concerned available exchange. As our goal is to predict the value and compare those with stock markets own rule and testing that whether or not our system works higher or not. The coaching method for the Back-propagation neural network is competitive. initial of all we tend to apply Principal Component Analysis (PCA) technique on information to scale back dimension. once reducing information dimension, we tend to fed it in neural network for coaching. One vegetative cell can "win" for every coaching set and it'll have its weight adjusted so it'll react even a lot of powerfully to the input within the next

time. As for various coaching set, completely different neurons win and their ability to recognize that specific set are raised. currently we tend to are describing the procedure employed in our stock exchange analyzing system.

- Study the Hyderabad stock exchange and collect the previous stock of ten completely different classes or organization.
- Store their six months information in a spreadsheet.
- This information has multiple dimensionalities.
- Scale back the spatial property mistreatment Principal part Analysis.
- Implement Hyderabad securities market rule called HSE rule.
- Train the reduced information set mistreatment neural network.
- Assess the performance of our projected system.
- Compare between our rule and HSE rule.
- Experimental Result Analysis The effectiveness of the rule has been even by mistreatment completely different organizations information. The Experiments are applied on AMD A8-6120 2GHz laptop with eight GB RAM. The rule has been enforced in MATLAB 2016.

Figure 1 shows the sequence of steps of our system

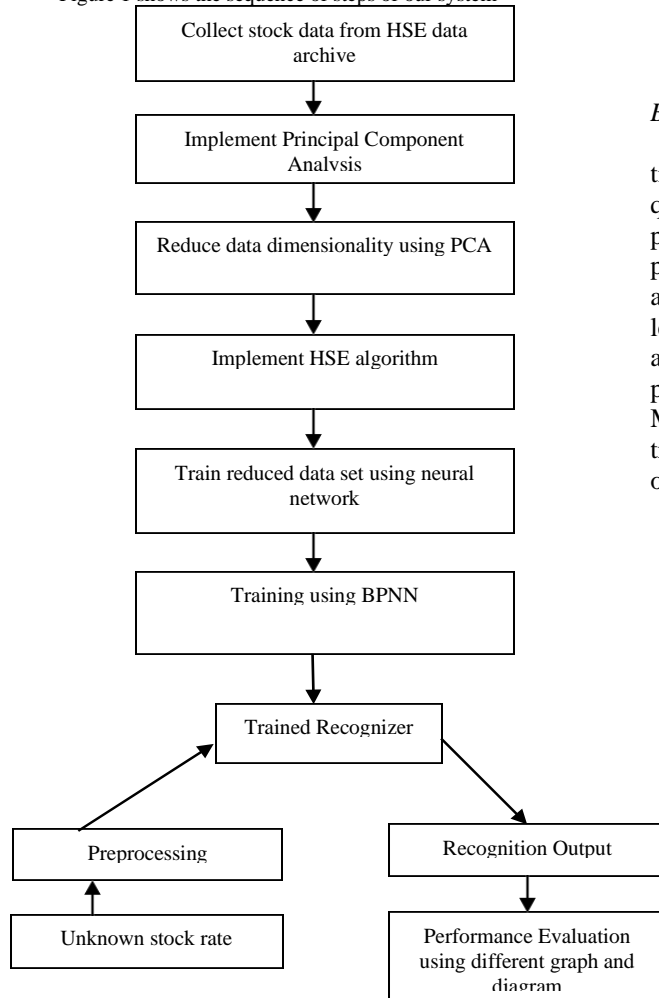


Fig 1. System Architecture

III. PROCESSING

A. Acquisition of information from securities market

As we tend to study and work with exchange knowledge, initially we want a many previous knowledge of exchange. we've got studied and analyzed the Hyderabad Stock Exchange as an information supply for our analysis work. we tend to choose City Bank, ACI, Grameen-Phone, AZIZ-PIPES, BAN- GAS, BEXIMCO, as our knowledge supply. when learning these firms we tend to store their last half dozen months

knowledge on a spreadsheet for additional process.

A	B	C	D	E	F	G	H	I	J	K	L
#	DATE	TRADING CODE	LTP*	HIGH	LOW	OPEN*	CLOSE*	YCP	TRADE	VALUE (mn)	VOLUME
1	04/07/2019	GP	375.5	381.9	374.3	379	375.4	376.7	1,319	95,393	146,896
2	03/07/2019	GP	375	387	375	381	376.7	381	1,652	93,822	247,529
3	02/07/2019	GP	382	390.1	380	390.1	381	388.9	1,286	77,214	202,220
4	29/06/2019	GP	389	398	384.6	398	388.9	394.6	2,078	95,466	398,540
5	27/06/2019	GP	395	401.9	393.7	400	394.6	397.8	1,376	136,372	342,968
6	26/06/2019	GP	398.3	404.9	395.2	404	397.9	403.6	1,760	200,182	503,578
7	25/06/2019	GP	405.9	411	402	408.9	403.6	408.6	2,238	214,995	526,733
8	24/06/2019	GP	409.2	415	403.5	405	408.6	402.4	3,238	210,519	522,536
9	21/06/2019	GP	395.3	405	385	385	403.4	383.2	4,074	491,023	1,295,016
10	20/06/2019	GP	382.6	385.9	379.9	381.8	383.2	379.3	1,951	143,868	373,893
11	19/06/2019	GP	379.7	384	378.8	382.6	379.3	378.8	2,121	178,529	468,335
12	18/06/2019	GP	380.6	382	374.6	374.6	378.8	374.6	2,768	285,529	756,907
13	12/06/2019	GP	374.6	381.4	373.3	381	374.6	377	2,216	146,566	389,429
14	10/06/2019	GP	376	395	376	394.1	377	390.9	2,714	166,798	435,577
15	10/06/2019	GP	390.6	398.5	388	395	390.9	395.3	1,232	55,37	141,661
16	07/06/2019	GP	394.8	407.9	382.2	406.9	395.3	405	2,004	102,36	295,956
17	06/06/2019	GP	404	408.5	403.5	407	405	405.6	1,335	102,578	252,544
18	05/06/2019	GP	405.1	410	405	409	405.9	407.6	1,359	19,491	291,728
19	04/06/2019	GP	407	412.9	401	405	407.6	402.4	1,267	92,559	227,995
20	03/06/2019	GP	400.1	415.2	400.1	415.2	402.4	411.8	1,952	89,940	220,524
21	21/05/2019	GP	416	427.9	412.7	427.9	411.8	426.3	1,735	104,091	249,254
22	30/05/2019	GP	424	428.8	424	428.4	426.3	428	968	68,619	95,972
23	29/05/2019	GP	429.8	433	426.5	432	428	431.9	798	101,136	255,330
24	28/05/2019	GP	432	439.8	431.5	433	431.9	433	1,039	122,845	282,478

Fig 2. Data archive of Grameen-Phone

B. Reduction of information spatiality

To train the network victimisation neural network, reduction of information spatiality is important for higher and quick coaching. we've got a dataset composed by a collection of properties. several of those options can live connected properties and then are redundant. Therefore, we should always take away this redundancy and describe every with less property. this can be precisely what PCA aims to try and do. The rule really constructs new set of properties supported combination of the previous ones. Mathematically speaking, PCA performs a linear transformation moving the first set of options to a brand new house composed by principal part.

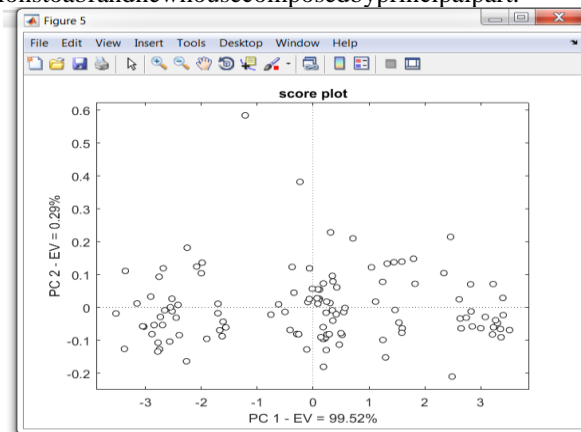


Fig 3. Score Plot of data of Grameen-Phone

After applying PCA on our every and each dataset we tend to get the chemist matrix.

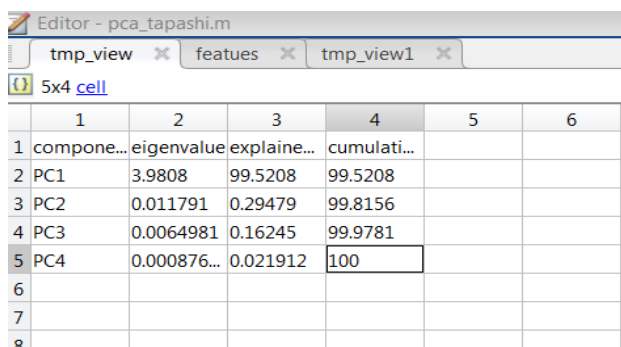


Fig 4. chemist Matrix

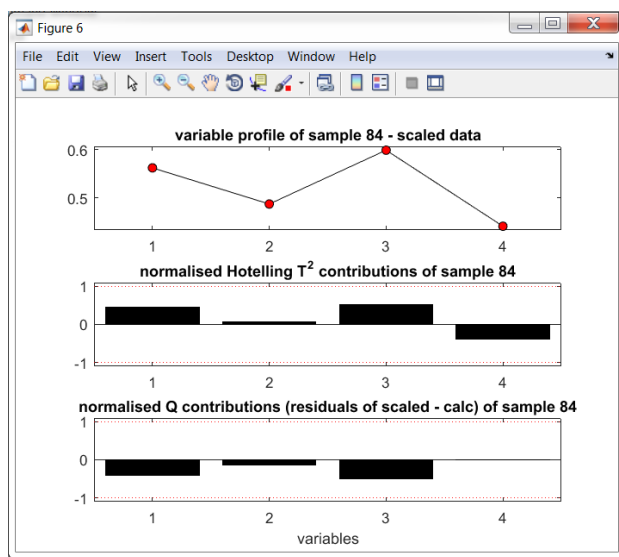


Fig 5. Normalized values for properties

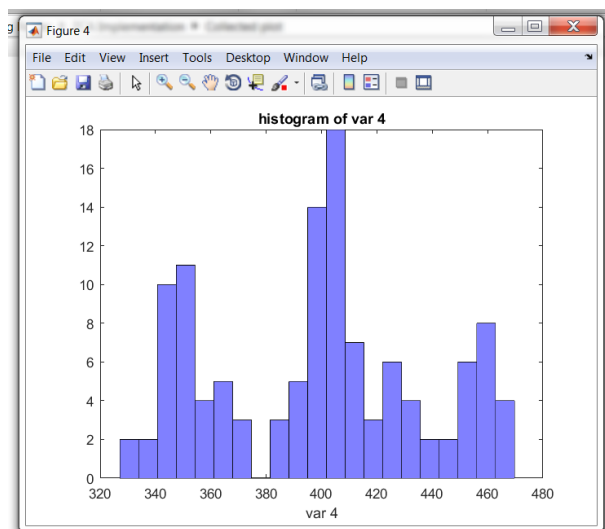


Fig 6. SampleHistogram for var4

For the information of our every elect company we tend to apply PCA on them and acquire the foremost authoritative properties. when flourishing implementation of Principal parts Analysis we tend to write the reduced information on Microsoft stand out sheet. currently our information are ready as AN input for neural network.

Fig 7 shows the information archive before Applying

PCA on Grameen-Phone company data:

A	B	C	D	E	F	G	H	I	J	K	L
#	DATE	TRADING CODE	LTP*	HIGH	LOW	OPEN*	CLOSE*	YCP	TRADE	VALUE (mn)	VOLUME
1	04/07/2018	GP	375.5	381.9	374.3	378	375.4	376.7	1319	55.393	146.896
2	03/07/2018	GP	375	387	375	381	376.7	381	1852	83.922	247.529
3	02/07/2018	GP	382	390.1	380	390.1	381	388.9	1286	77.214	202.220
4	28/06/2018	GP	389	398	384.6	398	388.9	394.6	2,076	95.466	380.540
5	27/06/2018	GP	395	401.9	393.7	400	394.6	397.9	1376	136.372	342.968
6	26/06/2018	GP	398.3	404.9	395.2	404	397.9	403.6	1760	200.802	503.578
7	25/06/2018	GP	405.9	411	402	408.9	403.6	408.6	2,239	214.955	535.723
8	24/06/2018	GP	409.2	415	403.5	405	408.6	403.4	3,238	213.519	522.536
9	21/06/2018	GP	399.3	405	385	395	403.4	383.2	4,074	431.023	1,235.095
10	20/06/2018	GP	382.6	385.9	379.9	381.8	383.2	379.3	1,651	143.889	373.853
11	19/06/2018	GP	379.7	384	378.8	382.6	379.3	378.8	2,121	178.529	468.335
12	18/06/2018	GP	380.6	382	374.6	378.8	378.8	374.6	2,769	285.529	756.907
13	12/06/2018	GP	374.6	381.4	373.3	381	374.6	377	2,216	146.566	389.429
14	10/06/2018	GP	376	395	376	394.1	377	390.9	2,714	166.799	435.577
15	10/06/2018	GP	390.6	398.5	388	395	390.9	395.3	1,232	55.37	141.661
16	07/06/2018	GP	394.8	407.9	392.2	406.9	395.3	405	2,004	102.36	295.996
17	06/06/2018	GP	404	408.5	403.5	407	405	405.9	1,335	102.578	252.544
18	05/06/2018	GP	405.1	410	405	409	405.9	407.6	1,359	101.891	259.729
19	04/06/2018	GP	407	412.8	401	405	407.6	402.4	1,267	92.599	227.595
20	03/06/2018	GP	400.1	415.2	400.1	415.2	402.4	414.8	1,552	89.949	220.524
21	31/05/2018	GP	416	427.9	412.7	427.9	414.8	426.3	1,735	104.091	243.254
22	30/05/2018	GP	424	428.8	424	428.4	426.3	428	966	66.619	155.972
23	29/05/2018	GP	429.8	433	426.5	432	428	431.9	798	10.136	255.330
24	28/05/2018	GP	432	438.8	431.5	433	431.9	433	1,039	122.845	282.478

Fig 7. Data archive of Grameen-Phone

After applying PCA:

A	B	C	D	E	F	G	H
#	DATE	TRADING CODE	LTP*	HIGH	LOW	OPEN*	CLOSE*
1	04/07/2018	GP	375.5	381.9	374.3	378	375.4
2	03/07/2018	GP	375	387	375	381	376.7
3	02/07/2018	GP	382	390.1	380	390.1	381
4	28/06/2018	GP	389	398	384.6	398	388.9
5	27/06/2018	GP	395	401.9	393.7	400	394.6
6	26/06/2018	GP	398.3	404.9	395.2	404	397.9
7	25/06/2018	GP	405.9	411	402	408.9	403.6
8	24/06/2018	GP	409.2	415	403.5	405	408.6
9	21/06/2018	GP	399.3	405	385	395	403.4
10	20/06/2018	GP	382.6	385.9	379.9	381.8	383.2
11	19/06/2018	GP	379.7	384	378.8	382.6	379.3
12	18/06/2018	GP	380.6	382	374.6	374.6	378.8
13	12/06/2018	GP	374.6	381.4	373.3	381	374.6
14	10/06/2018	GP	376	395	376	394.1	377
15	10/06/2018	GP	390.6	398.5	388	395	390.9
16	07/06/2018	GP	394.8	407.9	392.2	406.9	395.3
17	06/06/2018	GP	404	408.5	403.5	407	405
18	05/06/2018	GP	405.1	410	405	409	405.9
19	04/06/2018	GP	407	412.8	401	405	407.6
20	03/06/2018	GP	400.1	415.2	400.1	415.2	402.4
21	31/05/2018	GP	416	427.9	412.7	427.9	414.8

Fig 8. After applying PCA on data of Grameen-Phone

IV. PERFORMANCE EVALUATION AND EXPERIMENT RESULT ANALYSIS

A. Implement Hyderabad Stock Exchange (HSE) formula

At the start we tend to discuss concerning the various varieties of prediction, basic analysis is one in all them. As we tend to choose national capital exchange as our knowledge supply, we discover they need own formula for stock rate prediction. to match it with our system initially we tend to implement the HSE formula in MATLAB and write the solution and foretold price in another file. The short description of HSE formula as follows.

LTP = Last Traded Price

CLOSEP = Closing Price

YCP = Yesterday's Closing Price

OAP = Open Adjusted Price Index calculation algorithm (according to IOSCO Index Methodology):
Yesterday's Closing Index X Current M.Cap

Current Index = $\frac{\text{Opening M.Cap}}{\text{Yesterday's Closing Index X Closing M.Cap}}$

Closing Index = $\frac{\text{Opening M.Cap}}{\text{Yesterday's Closing Index X Closing M.Cap}}$

Current M.Cap = (LTP Total no. of indexed shares)
 Closing M.Cap = (CP Total no. of indexed shares)
 Abbreviations and Acronyms M.Cap - Market Capitalization
 HSE - Hyderabad Stock Exchange IOSCO - International Organization of Securities Exchange Commissions (IOSCO) LTP - Last Traded Price CP - Closing Price

Here we give a sample example of Grameen-Phone after implementing HSE algorithm for next day prediction:

#	LTP*	HIGH	LOW	OPENP*	CLOSEP*	YCP	CurrentIn dex	ClosingIn dex
1	375.5	381.9	374.3	378	375.4	376.7	291.9244	291.979
2	375	387	375	381	376.7	381	292.7424	292.7977
3	382	390.1	380	390.1	381	388.9	293.567	293.6138
4	389	398	384.6	398	388.9	394.6	294.3634	294.415
5	395	401.9	393.7	400	394.6	397.8	295.1301	295.1833
6	398.3	404.9	395.2	404	397.8	403.6	295.8263	295.8832
7	405.9	411	402	408.9	403.6	408.6	296.4874	296.5509
8	409.2	415	403.5	405	408.6	403.4	297.0675	297.16
9	399.3	405	385	385	403.4	383.2	297.6149	297.7164
10	382.6	385.9	379.9	381.8	383.2	379.3	298.3445	298.3271
11	379.7	384	378.8	382.6	379.3	378.8	299.5404	299.5172
12	380.6	382	374.6	374.6	378.8	374.6	300.7581	300.7391
13	374.6	381.4	373.3	381	374.6	377	301.9296	301.9454
14	376	395	376	394.1	377	390.9	303.2526	303.2687
15	390.6	398.5	388	395	390.9	395.3	304.5443	304.549
16	394.8	407.9	392.2	406.9	395.3	405	305.6496	305.6531
17	404	408.5	403.5	407	405	405.8	306.7509	306.751
18	405.1	410	405	409	405.8	407.6	307.7883	307.7813
19	407	412.8	401	405	407.6	402.4	308.8234	308.8106
20	400.1	415.2	400.1	415.2	402.4	414.8	309.845	309.8282
21	416	427.9	412.7	427.9	414.8	426.3	310.9064	310.8747
22	424	428.8	424	428.4	426.3	428	311.8753	311.852
23	429.8	433	426.5	432	428	431.9	312.7805	312.7464
24	432	439.8	431.5	433	431.9	433	313.6602	313.6394

Fig 9. Result after HSE algorithm Implementation for Grameen-Mobile

B. Training

When we tend to apply principal element analysis in our information set we got the foremost potent information properties. These options are used as Associate in Nursing input vector for our neural network. For our neural network we tend to use terms list of last vi months of specific organization as a target vector. The value-price-terms-damage is that the final price at that a security is listed on a given mercantilism day. The terms represents the foremost up-to- date valuation of a security till mercantilism commences once more on the subsequent mercantilism day. Hence in our system the amount of neurons in input layer is 124×5 , neurons in input layer for neural network and variety

of neurons in hidden layer is twenty, and eventually the neurons in output layer is 124. the amount of neurons in hidden layer will vary from twenty five to fiftieth of its input neurons. In our Training:

Number of neuron in input layer: 124×5

Number of neuron in hidden layer : 20

Number of neuron in output layer : 124

Learning rate () : 0.001 and threshold () : 0.9

Epoch : 2000

After specification of those experimental parameters we tend to get into the implementation of Back-propagation neural network (BPNN). At first, initial weights are at random generated for the network. In feed forward step, input patterns are propagated through the network one by one and actual outputs are calculated. scrutiny between actual and target outputs, in keeping with BPNN algorithmic rule, magnitude of error

is set and weight updates happen through back propagation with a read to reduce the error later on. once all patterns in pattern set are fed into the network and weights are updated as expressed earlier, this constitutes one epoch as per the definition of literature.

Updated Weight = weight (old) + learning rate * output error * output (neurons i) * output (neurons i+1) * (1 - Output (neurons i+1)).

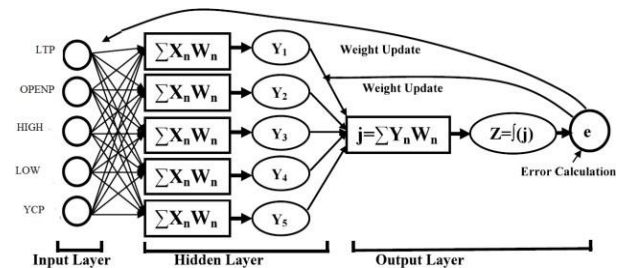


Fig10. Network architecture

Hidden layer somatic cell generate the ultimate output that is that the compared with the \$64000 output and calculate miscalculation signal e. Unless calculable reaches satisfactory level measured supported error threshold as mere before, epochs are continued . during this work, ten totally different corporations are trained on an individual basis and their results are analyzed.

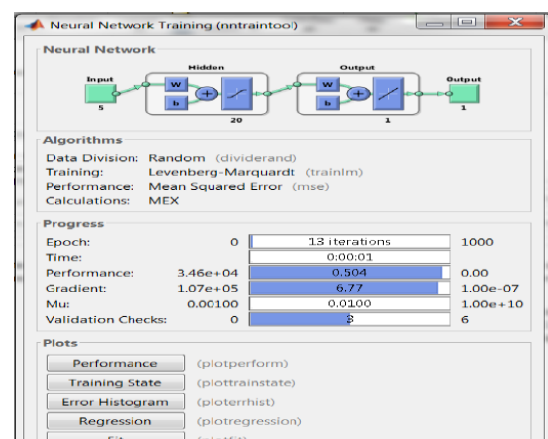


Fig 11. Training the network

After a 1000 iteration the coaching is stopped and error rate is in minimum convergence level.

At 201 epochs best coaching performance is found.

C. Testing

The performance of a network is usually measured supported however well the system predicts market direction. Ideally, the system ought to predict market direction higher than current ways with less error. Some neural networks are trained to check. If a neural network will vanquish the market systematically or predict its direction with cheap accuracy, the validity of network is questionable. alternative neural networks were developed to vanquish current applied mathematics and regression techniques. Most of the neural networks used for predicting stock costs. so as to justify the performance of the neural network, varied experiments are

distributed. All experiments are performed with for coaching the system for recognition. there's no overlap between the coaching and check information sets. when productive completion of the coaching completely different companys information, neural network is employed to acknowledge unknown information each as a full and on an individual basis.

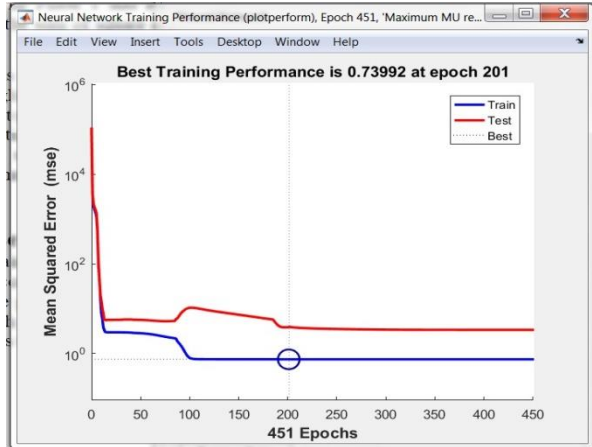


Figure12.BestTrainingPerformance

We have allotted the experiment for ten totally different class firms and determined their last six months information, apply PCA on them to cut back information dimension and at last train them with neural network and predict their information looking on their previous day rate. at that time we have a tendency to compare their performance exploitation mean sq. error. The data set is partitioned off into 2 components. the primary one is employed for coaching the system and therefore the second for take a look at the system so as to gauge the performance. for every organization, options are computed, reduced and hold on for coaching the network. 3 layers Back-propagation neural network (BPNN), i.e. one input layer, one hidden layer and one output layer are taken. If range of neurons within the hidden layer is accrued, then a controversy of allocation of needed memory is occurred. Also, if the worth of error tolerance is high, desired results don't seem to be obtained, thus dynamic worth-the worth of error tolerance in a very minimum value, high accuracy rate is obtained. Additionally the network takes additional range of epochs to be told once the error tolerance worth is a smaller amount instead of within the case of high worth of error tolerance within which network learns in less range of cycles and then the educational isn't terribly fine. The result additionally varies for every organization. Numerous experiments are allotted to justify the performance of the system. All experiments are performed with set of coaching information and fully totally different information set for take a look at. there's no overlap between the coaching and take a look at information sets. The neural network is trained exploitation the default learning parameter settings (learning rate zero.001, threshold zero.9) for one thousand epochs.

Table I Predicted Price of Grameen-Phone

Date	LTP	Open Price	Close Price	Predicted Close Price	Error Rate (%)
04/07/2018	375.5	378	375.4	377	0.42621
05/07/2018	382	378	383.9	379.7	1.09403
08/07/2018	390	387	387.8	385.5	0.59309
09/07/2018	388	389	387.9	387.2	0.18046
10/07/2018	380	390.6	379.5	382.4	0.76416
11/07/2018	382	380	380.7	379.1	0.42028
12/07/2018	388.6	385	388.5	385.7	0.72072
15/07/2018	381	390	383.1	386.4	0.86139
16/07/2018	386.3	390	388	389.2	0.30928
17/07/2018	399	392	397.7	392	1.43324

Our prediction for Grameen-Phone for ten days in month of Gregorian calendar month shows however it closely associated with our foretold value and its actual value. Grameen-Phone is associate degree A class company. Following plot shows however target knowledge fits with train knowledge.

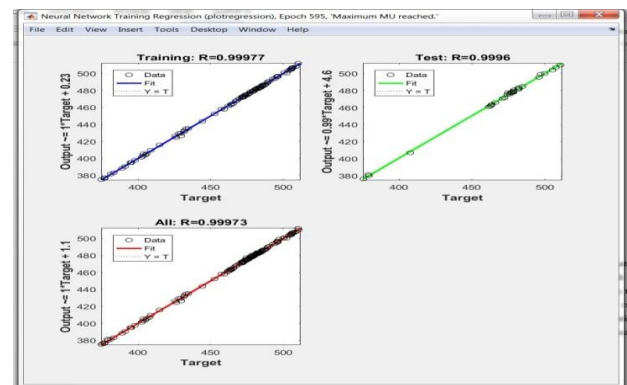


Figure 13. Snapshot of how target-data fits with the train Data Error Histogram for Grameen-Phone Company is shown below:

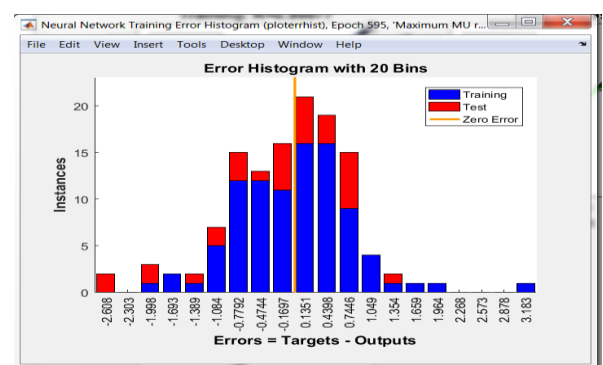


Figure 14. Error Histogram for Grameen-Phone with 20bins



Fig 15. Predicted price of Grameen-Phone for 10 days The experimental results show that this strong methodology is effective and economical in prediction stock costs compared with HSE formula for stock exchange prediction. Now we've got thought-about one B class company. For our analysis work we elect Company named Azizpipes. As like Grameen-Phone we have a tendency to apply PCA on that for knowledge dimension reduction, than apply HSE formula on that. afterward we have a tendency to trained the reduced knowledge mistreatment Back-propagation neural network. onco hito coaching we have a tendency to check it mistreatment some sample knowledge and compared it with its actual value.

Table II Predicted Price of Aziz-Pipes

Date	LTP	Open Price	Close Price	Predicted Close Price	Error Rate (%)
01/02/2018	148.6	155	151	152	0.66
04/02/2018	143.5	151.9	142.3	145.5	2.25
05/02/2018	141	145	140.9	139	1.35
06/02/2018	143	144	142.4	144	1.12
07/02/2018	143.1	142.2	144.7	145	0.21
08/02/2018	143.1	145	143	140	2.10

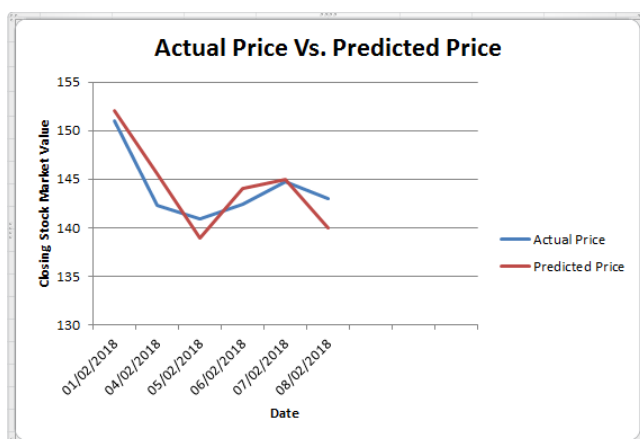


Fig 16. Predicted price of Aziz-Pipes for 6 days Here, we observed that for some sample our predicted price is so close to actual price.

V. CONCLUSION

The main purpose of acting on securities market prediction is to extend the capitalist available market and build the many profit by predicting the market rate. In our planned system, we tend to developed a model to predict the stock rate of a particular company by coaching their previous information in neural network. to coach our system quicker, we tend to initially scale back the info dimension exploitation PCA. Once self-made reduction of the info dimension we tend to got the foremost important options of information. once coaching, we tend to check our system however with success it predict the stock rate. We tend to ascertained that if we tend to use additional information to coach the network then the performance are raised considerably. For our system we tend to used Back-propagation neural network that is one among the most effective neural network. It reduces a blunder between the particular output and desired output during a gradient descent manner. Performance isn't continually satisfactory as a result of it'll be quite tough to predict with a thousandth accuracy.

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