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PRODUCT DEVELOPMENT PROCESS USING AN ANN METHOD IN THE SMALL ELECTRICAL INDUSTRY

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Abstract:

A key factor in viably managing the complexities of new thing enhancement in any affiliation is having an obvious appreciation of the methodology. The system is clearly, introduced an associate in a nursing setting. For the NPD procedure, four areas of the setting are depicted to be an additional goal and these region unit customers, advancement, contenders and suppliers. To gain ground NPD aggregate exercises ought to be unstable to the necessities of clients, and to contenders, advancement, and suppliers. New headway can't be managed advancement while not a clear cognizance of clients and their dynamical needs. Plentiful of the essential focal point of this book is on habits by which and infers that to satisfy client needs. Combining the "voice of the customer" into the procedure is essential at each stage from chance ID and plan age through the particular testing and pushing of the stock or organization. The money related, social, authentic, and political setting influences the client. Associations should end up talented at not only indisputable client needs, at any rate moreover at predicting needs that customer themselves recognize extraordinary expressive. NPD clusters generally endeavour each human examination considers and experiential gatherings to spot dismissed and difficult to verbalize client needs.

KEYWORDS:New product development, ANN, Tendering, MSE, MATLAB, Bidding.

1. INTRODUCTION:

In the present market cautious structuring and a legit item technique square measure basic to help you prevailing inside the market. Firms everyplace square measure aggressive ever to create a reasonable and particular item or administrations and gain the following position inside the market. Firms build up a high assortment of item per annum. A large portion of those items come up short in light of an absence of brilliant item improvement model end up being basically another high incentive for the corporate.

The point of this postulation is to build up an advanced technique. Finnish supplier makes a reasonable item for the exchange. Creating an exquisite item that gives numerous edges to the buyers is that the organization mission and a steady time one among the most qualities of electrical instrumentation organization for the genuine electrical exchange. Since the advancement could be a persistent technique and company X is developing its item portfolio unendingly, the board individuals felt the prerequisite in organizing the stock improvement strategy in an exceedingly all around characterized continuous technique that is easy to pursue and convey inside. Best item square measure very fundamental for organization achievement. The development could be an ought to on the off chance that you might want to proceed focused inside the market. However, the extraordinary improvement is one among the most hazardous procedures that require a centre and high speculations. Numerous examinations are cleared out the no-hit advancement cases, and achievement drivers are found. Firms square measure utilizing an organized arrangement to improvement and testing strategy encourage them to oversee actualizing these achievement drivers and scale back the opportunity of item fizzle. The newly created item strategy should grasp each progression that should be taken once growing new item.

2. LITERATURE REVIEW:

Geoff tindsley, Paul stephenson et al. The present paper is based on the process of E-procurement in the private organization by this paper clear understanding of tender process through E-procurement software and this help in recognizing the particular tender which beneficial and achievable for company by this examination is fundamentally worried about building up the present status, reasonable items and asset viability of E-tender[1].(2008)

Chen Jiangchao, Qianyan, Zhang Junling et al. The data and joining of offering and offering process is the way to take care of the issue of the logical inconsistencies of offering and offering that they can't perceive one another and accomplish asset sharing. My paper utilized hypothetical and mechanical information of programming improvement gained from the major of programming designing, in which hypothesis is utilized to coordinate practice. My paper depends on the hypothesis of programming building. To start with, I put forward the present circumstance and the issues of offering and an offering a framework. At that point, I examined the achievability of my framework. Third, I gave the information reconciliation program dependent on the extensible markup language[2]. (2010)

Ms Sonali. B. Maind, Ms Priyanka Wanker et al. This research work is used for understanding the basic working of ANN process and also it shows that in present time how ANN approach will overtaking the orthodox approach of finding solutions in many industries this approach will help in generalising the problem in a simple manner[3]. (2014)

Prathna Burnanju et al. This paper present prediction and improvement critical success factors of NPD in an industry using ANN methodology and shows how a company can create a successful product development by optimizing the MSE values in MATLAB software. The paper helps in deciding the

data analysing of a company through the ANN approach properly with clear successive results[4]. (2007)

Oludelea Wodele et al. Paper show about the application of ANN in different fields of engineering in this the author has research about how ANN can be used in different ways to simplify the problem in data processing, information technology, entertainment, broadcasting[5]. (2009)

Rajesh Kumar et al. Author applied ANN method in the manufacturing industry and explain that ANN can be used in every step of a manufacturing process and also particularly focused on manufacturing process planning, scheduling, system assembling and logistics[6]. (2014)

3. METHODOLOGY:

3.1 Artificial Neural Networks (ANN):

Artificial Neural Networks are tolerably foul electronic model reliant on the neural structure of the psyche. The psyche basically gains for reality it is clear that a couple of issues going past the present PC can truly be understood by a little essentialness capable group. This cerebrum showing moreover ensures less particular procedures for making machine courses of action.This better methodology for IT diminishes the straightforwardness of giving the system more weight than its inexorably standard accomplices. These normally roused PC methods are seen as the accompanying genuine movement for the PC business. Without a doubt, even clear animal cerebrums are moreover fit for working amazingly for PCs. ANN model is an algorithmic model based on arithmetic called threshold logic. ANN is basically is divided according to its application its mainly biological system that is neural network of our brain but it is also used as a computational tool in solving problems in industries and simulation of data and productivity improvement and it has come under Artificial intelligence which is now applicable in every problem related to anything like security issue and also in optimization of even little problems in logistics, supply chain, work allotment and increasing the profit of industry with least working inputs solving the main problem of industry that is proper NPD of industry.

3.2 Working of ANN:

ANN method is applied by using MATLAB software and this process is by data simulation in this there are two sets of data is used for problem-solving and for that one set of data is input data and other data is target data this data are arranged in an excel sheet according to input data and target and then in MATLAB software there is an app called neural net fitting in this we train the input data and output data and after that there are many samples generated these samples are showing non linear relation on graph generated by neural network after that it will show mean square error (MSE) value after regular training of data set then least value of MSE is shown which is showing how the target value achieved by reducing MSE value. After that time series prediction is also done by ANN method in this the app in MATLAB software called neural net time series in this input and output data is trained and after that tested value is obtained in a graph showing positive and negative values by which the optimization of a target is done. Basically, ANN process is a time prediction model for time analysis and for improvement in the upcoming goals of companies.

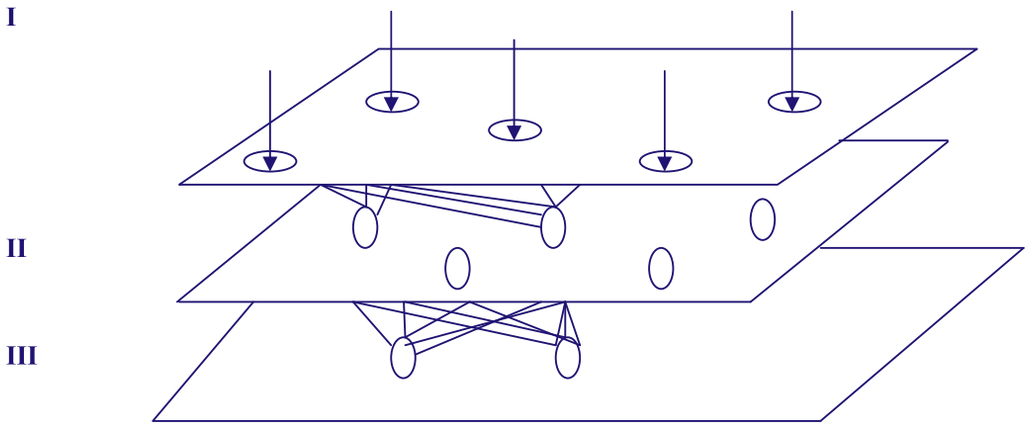

Figure 1. Simple neural network diagram. I-I/P layer, II-hidden layer, III-O/P layer

Figure 1 shows the structure of simple neural network diagram in this input layer which is input data and hidden layer is target data and the output layer is output MSE values circles are neurons which are connected forms samples in ANN method.

The apparatus compartment itself disconnects the data into three precedents which are planning, endorsement and testing independently. For planning purposes a couple of instances of the data recorded before is shown to the framework is adjusted by its botch. As usual, it has taken 70%(57 tests)thus. Around 15%(12 tests) are used to check mastermind theory, and to end planning when hypothesis stops pushing ahead.

4. RESULT AND SIMULATION:

4.1 Case study:

Data collection was carried out by the case study of Tender of Shree ram group of industries. Data was generated on an excel sheet by the tender manager of the company Mr T.S. Khurana this is 2 yr data as per month productivity according to the PD time.

This study is about the tender that is received by the industry and the different process involving in the development of the control panel. Tender is issued by BSES organisation to supply them

control panel so, in this study, we have checked the PD process and also predict the time analysis of their productivity by the data provided by industry and also optimize the target of increasing the production rate of a new product development process. We are collecting data set of 2 years of one complete tender in shree ram industries in a format of per month productivity and worker to work particular Tendering and bidding competition of project.

4.1.1 Tendering Process in industry:

Open Tendering is a process used by public and large scale companies for supply products and services to their particular project by inviting them for bidding of that particular tender and for that company releases their tender in an open market for that many small industries are submitted their bid. In this process, large scale industries are using their particular terms and condition like time duration, bidders past record, technical specifications of the product and the bidder who fulfilled all terms and condition according to tender the tender will be given to that industry.

Under particular offering, the pioneer publicizes his undertaking and solicitations temporary workers to use to be set on a particular rundown of contractual workers world health organization are welcome to offer for the task. Temporary workers applying square measure given a posting of learning they should offer to view in order to 'pre-qualify'. The favourable position of the pioneer is that he will pick exclusively those temporary workers. In any case, since temporary workers have pre-qualified its troublesome to dismiss untouched low offer, in spite of the fact that it appears to be regrettably low except if that is because of some undeniable misstep.

4.1.2 Bidding Process:

Bidding can be performed by a "purchaser" or "supplier" of an item or services dependent on the setting of the condition. Concerning barters, stock trade, or land the value offers a business or individual is eager to pay known as a bid. With respect to corporate or government obtaining exercises, the esteem offers a business or individual is anxious to sell is moreover called a bid in like a manner used while putting down a bet in card redirections. Bidding used by various money related claims to fame for choosing the premium and along these lines the estimation of the article or property, at present of trendsetting advancement, the internet is favoured stage for giving workplaces; it is a trademark technique for choosing the expense of an item in a free market economy.

Bidders bid on the minimum interest rate that is acceptable for them to receive. Bidders do not bid a tax lien amount. The winning bidder will have to pay the delinquent taxes and penalties in full. The winning bidder will receive a tax lien for that amount. The interest received is the bid. A bid cannot be an interest rate that is higher than what the taxing authority can legally charge the property owner.

4.2 Applying ANN in the case study:

For training neural network the no. of input values should not be too large and should not be too small as it will affect the structure of the neurons. But the recorded values are very large. So to reduce these numbers the modelling can be done so as to get data sets values of the per day productivity and total labour. After performing short circuit test and offline calculation which comprises of collecting data regarding various faults at different locations in terms of per year productivity and total labour the next step is to perform an online calculation. Online calculation include the following step-

Step 1- Training of neural network based on the collected data.

Step 2- Validation and testing of the data.

Step 3- Based on the testing of the data identify the productivity type and its industries.

Figure 2: Input matrix showing Industrial Data collection based on productivity

	A	B	C	D	E	F	G	H	I
1	DATA OF SHREE RAM INDUSTRY OF EACH STEP PD PROCESS (2 yr) (for 1 tender complete)								
2	Sr.	Base line	Workers	Assembly line	Total	Productivity	Storage	Drop	Target
3	no.	delay	T=300	in (days)	product	in %	time	order	of PD
4	Month	(PD start)			devloped	company	in days		
5	1	2	238	15	2	7.5	11	1	98.6281
6	2	2	280	37	5	12.7	23	0	98.6281
7	3	0	248	21	3	10.2	17	1	98.6281
8	4	0	243	29	3	10.6	19	1	98.6281
9	5	2	288	31	5	19	26	0	98.6281
10	6	0	279	32	5	14	24	0	98.6281
11	7	0	285	32	5	17.9	29	0	98.6281
12	8	2	284	31	5	10	26	1	98.6281
13	9	0	256	18	3	13	18	0	98.6281
14	10	0	283	19	5	12	27	1	98.6281
15	11	2	257	18	4	10	16	0	98.6281
16	12	0	239	16	2	17.5	10	1	98.6281

17	13	2	257	19	5	10	22	0	98.6281
18	14	0	239	9	2	11.6	28	1	98.6281
19	15	0	246	12	2	15.5	13	0	98.6281
20	16	0	192	7	1	15.8	6	0	98.6281
21	17	0	283	19	4	14.8	18	0	98.6281
22	18	0	245	16	2	19.9	14	0	98.6281
23	19	0	292	15	6	14.4	31	2	98.6281
24	20	0	283	18	5	18.7	27	1	98.6281
25	21	0	276	18	4	16.2	21	1	98.6281
26	22	0	272	18	4	10	21	0	98.6281
27	23	0	274	18	4	15.6	19	0	98.6281
28	24	0	275	18	4	12.7	18	0	98.6281

4.2.1. A layered function of industrial data targeted and input sample:

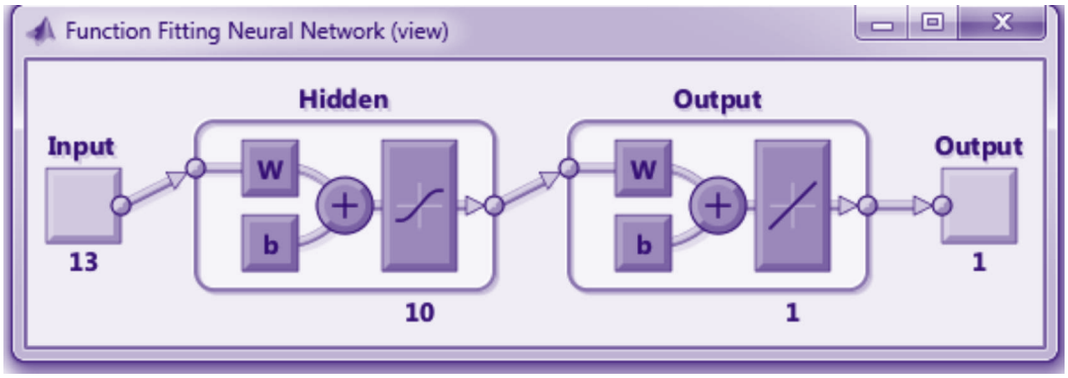

Figure 3: Hidden and output layers data sets

Info layer: The input layer has three hubs. The bias hub has an estimation of 1. The other two hubs take X1 and X2 as outside sources of info (which are numerical qualities relying on the information dataset). As examined over, no calculation is performed in the input layer, so the yields from hubs in the input layer are 1, X1, X2 separately, which are bolstered into the hidden layer.

Concealed layer: The hidden layer additionally has three hubs with the bias hub having a yield of 1. The yield of the other two hubs in the hidden layer relies upon the yields from the input layer (1, X1, X2) just as the loads related to the associations (edges). Correspondingly, the yield from the concealed hub can be determined. Keep in mind that f alludes to the enactment work. These yields are then sustained to the hubs in the output layer.

The system at that point accepts the principal preparing precedent as info (we realize that for information sources 35 and 67, the likelihood of pass is 1).

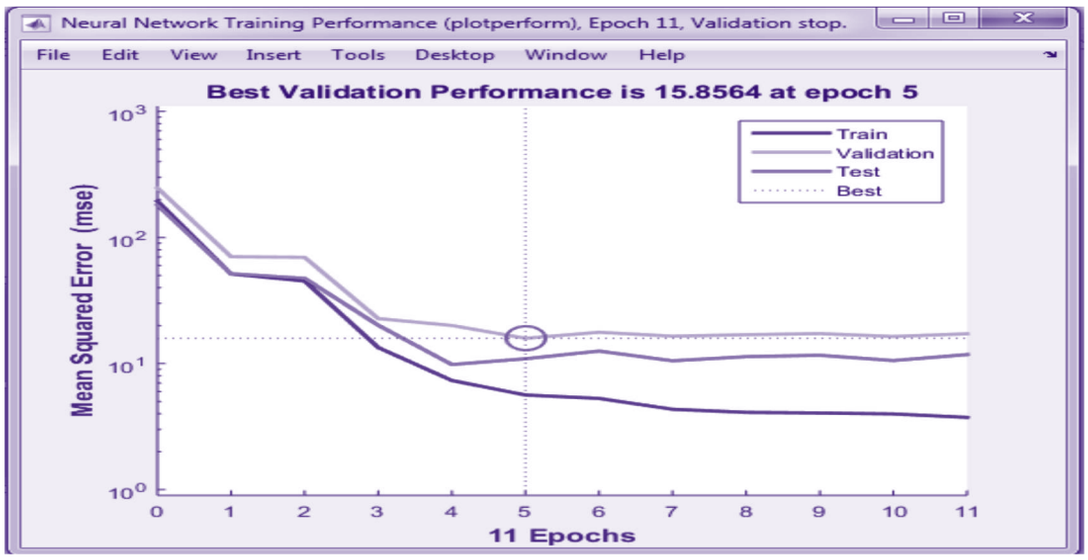

Figure 4: MSE constant of input sequence data sets

· Input to the system = [35, 67]
· Desired yield from the system (target)= [1,0]

At that point yield V from the hub in thought could be determined as beneath, (f is an actuation capacity, for example, sigmoid):

V=(1*w1+35*w2+67*w3)

Essentially, outcomes from the other hub in the shrouded layer are likewise determined. The yields of the two nodes in the concealed layer go about as contributions to the two nodes in the yielding layer. This empowers us to compute yield probabilities from the two nodes in yield layer.

The best validation comes at 0.091234 at 55 epoch. Similarly, the confusion matrix, receiver operator characteristic and training state for a case are shown in figure 4 respectively.

4.2.3 Production growth in 11 epoch input data:

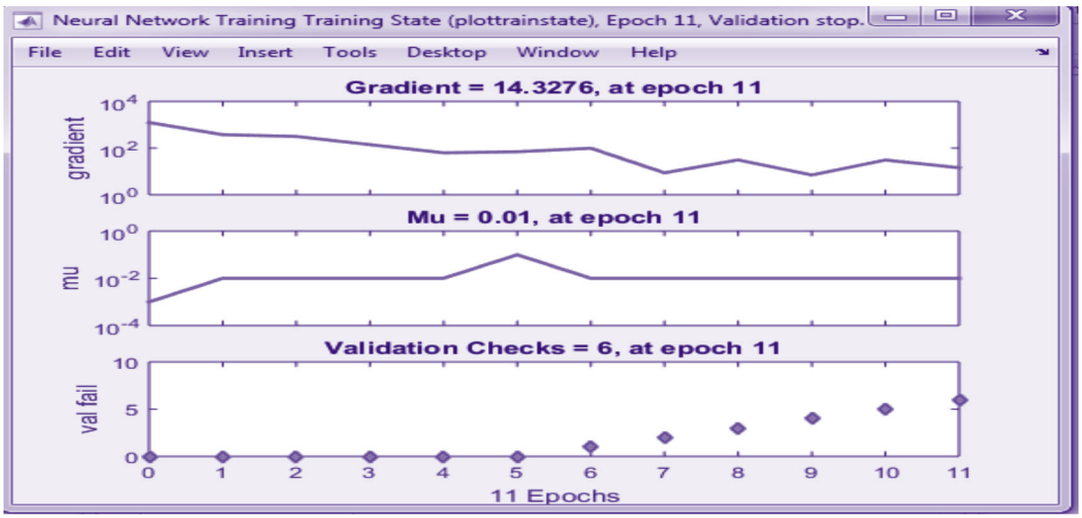

Figure 5: optimization of all productivity rate

Since the mean square error which is the main parameter for the successful training comes out to be very low which indicates that training and validation of the network have been completed successfully. In this case the mean square error for all the three steps training, validation and testing come out to be very low. The performance plot indicating mean square error against different epoch for all the three steps i.e. training, validation and testing is shown in figure 5.

4.2.4 Productivity improvement prediction sampling:

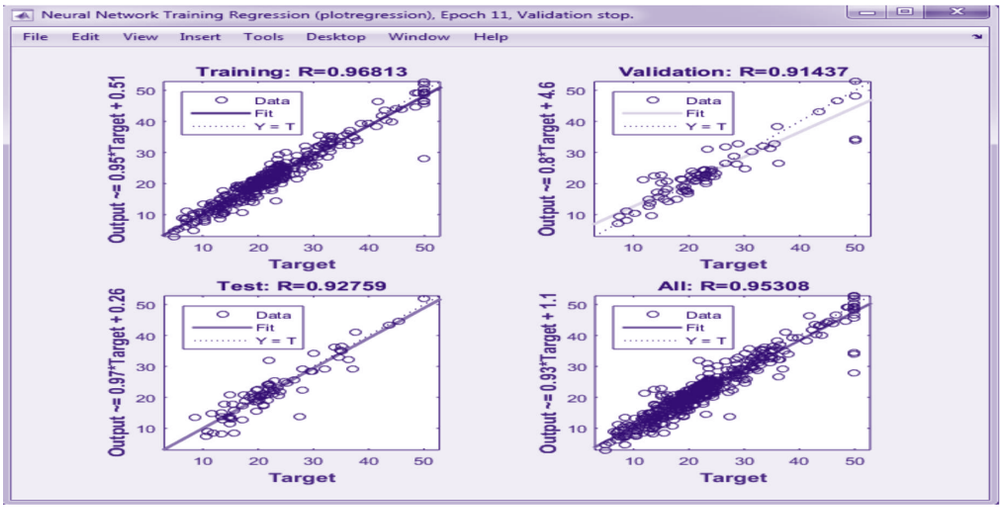

Figure 6: optimize result up to 5-year data sets in shree ram industries

Out of the 81 samples 57 have used for training and 12 each has been used for validation and testing purpose. The results have been expressed in terms of MSE (mean square error) which was coming out to be very close to zero. Also, the performance plot which is a direct indication of the successful training, testing and validation show the best validation occurs at 55 epoch.

4.2.5 Time series analysis production:

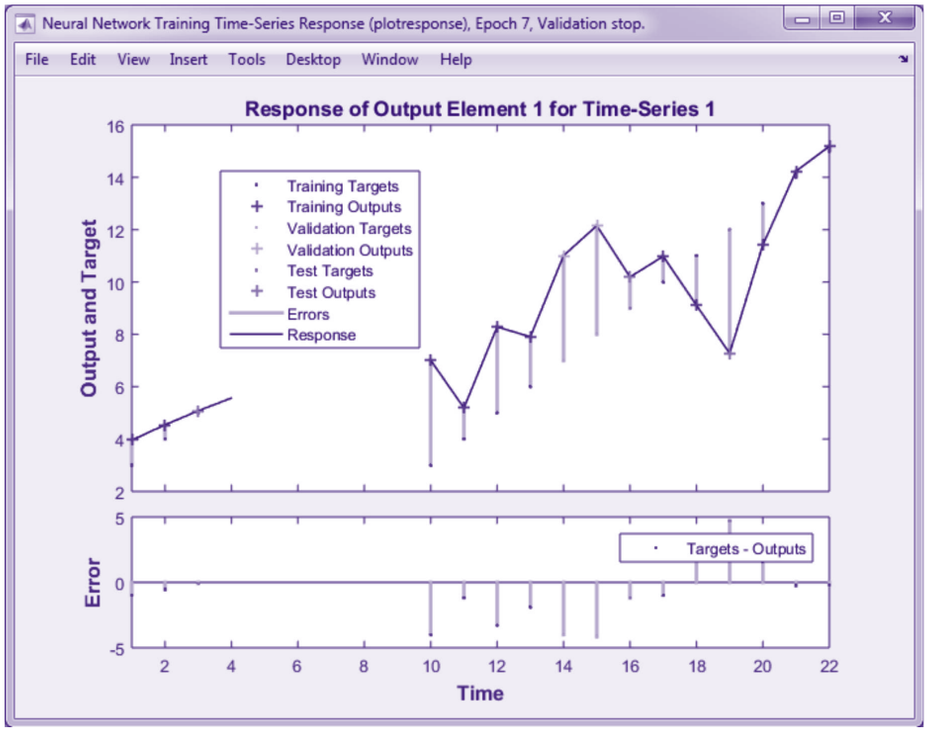

Figure 7 optimize result up to 5-year data sets in time series shree ram industries

In this study, we have created five neural network model with the help of MATLAB N.N. Toolbox i.e. network 1, network 2, network 3, network 4 and network 5, based on the above mention parameter. But every single neural network has different training function that gives the basis for comparative analysis of the network.

Table 1: Showing networks with MSE values

Network Of Multilayer	Accuracy (%) Optimized values	MSE
Network 1	98.93%	0.091234
Network 2	98.94%	0.091232×10^{-2}
Network 3	98.945%	0.091245×10^{-3}
Network 4	98.97%	0.09178×10^{-4}
Network 5	99.91%	0.0958×10^{-5}

We have train every single network three times and get the difference in MSE value and regression plot. as we have mentioned in figure 3, 4, 5, 6 and in the same way figure 7 and so on. Where figure 4 represents a validation performance graph on MSE (mean square error) and 5 represents a regression plot. On the basis of acquired score we have created a performance shows MSE value of network 5, iteration 2 is 0.043 that is very less than other networks of the table and shows the overall regression value of the network 5, iteration 2 is 0.0958×10^{-5} that indicates model is closer to the desired output. So that network with TRAINCGF is the best model and out of five models for the prediction of the occupational stress of the company professionals also fined maximum accuracy parameter 99.91%.

At this stage, we can reason that proper examination through artificial neural network methods makes one mindful about their state of world-related feeling of anxiety. This model perceives one's anxiety so auspicious it tends to be fixed by legitimate treatment and directing. After outcome investigation, we have discovered that network 5 (feedforward back proliferation arrange) with training function TRAINCGF has given best execution. Test estimate was 50. So that this model can be used in the large set of data and get the desired output and satisfactory result.

5. CONCLUSION:

In the present scenario of industries, there is a high level of competition in product development and product supply fields, for that industry need a proper product development process and for that prediction of a successful product without less product failure will play a key role in industry success. In this case study we take data of different steps of product development and take as input in ANN method and set the target according to industry productive rate by training the data through various networks and by doing multiple iterations the least MSE value showing in network 5 which is 0.0958×10^{-5} and accuracy(%) optimized values 99.91% by this method we predict the time analysis of successful product development process and the tender for

which the time limit is 2 yr is ready and supply in BSES organisation with proper time and for that the bill of product i.e. control panel will be clear in the least time by BSES and the industry will increase their economy and this study helping industry for increasing their success in financially and optimize their productive rate and also verify the unnecessary steps taken in development of control panel i.e. the product of industry and after analysing through different parameters of product development outcome of this study is by using ANN as a tool we can optimize the product development rate and this paper is to help those industries involved in product development and supply sector.

5.1 LIMITATION OF CASE STUDY:

- As we have using the ANN methodology in this case study so the main problem arises is to selecting data for training network model in this data of industry is not in a proper manner so we have to convert data according to the network for training the network.
- In ANN method it is an algorithm model using for optimizing and for time prediction in various fields like market analysis, quality control and industry purpose so it generally shows the predicted value by different networks so most of the times it will show positive results and sometimes also show negative results.

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