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ANN in Medical Field Survey Paper

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ABSTRACT: Neural networks are frequently used as a powerful discriminating classifier for tasks in medical diagnosis for early diseases detection. The goal of this work is to describe Modelling issues that affect the performance of an ANN. One critical decision is to determine the appropriate architecture, *that* is the number of layers, the number of nodes in each layer, and the number of arcs which interconnect with the nodes. Other network design decisions include the selection of activation functions of the hidden and output nodes, the training algorithm, data transformation or normalization methods, training and test sets, and performance measures. In this paper we survey the above-mentioned modelling issues of a neural network diagnosis. The survey also reports that disease diagnosis using ANN technique is more suitable than traditional statistical and numerical methods**.** This survey also reports current research direction of ANN in medical field.

KEYWORDS: ANN; Concept; ANN modelling Issues; Proposed Method; MLP; Backpropogation

I. INTRODUCTION

ANN gives an effective, strong and important tool for doctors in examining, modelling and making sense of composite patient data across an extensive range of medical applications and systems[3].

Research in the field of medical for ANN has been under focus for many years. Unfortunately, to our present information, none of this type of research was capable to enter the clinic and help doctor in his decisions. Because, this is considered as a misunderstanding that the machines could replace the work of the doctors. Neural Network does not have goal for replacing the radiologist or removing the value of tests done in a laboratory, rather it is the way of supporting the doctor in their disease detection procedure[3].

Below Diagram Shows Current Research of ANN in Medical Field:

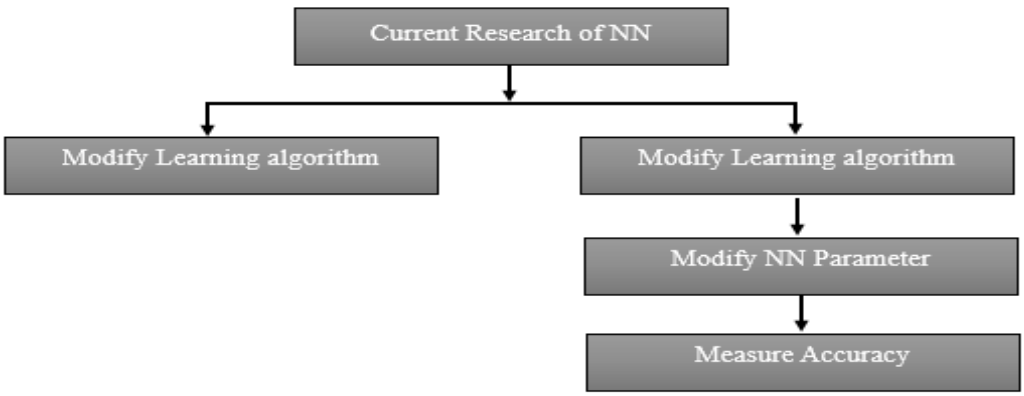

Fig 1: Current Research of ANN

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ARTIFICIAL NEURAL NETWORKS

ANN is a computer based tool that usually intends to give explanation for the similar behaviour of the sensible human mind. It is a network consisting of highly inter-connected processing nodes functioning in related to each other. These entities or elements are motivated by the biological nervous systems. The relationships between these elements are determines the system work naturally. A layer in a system is defined as a subgroup of processing nodes. The first layer is input layer. The last layer is output layer. And in between layer is called hidden layer[3].

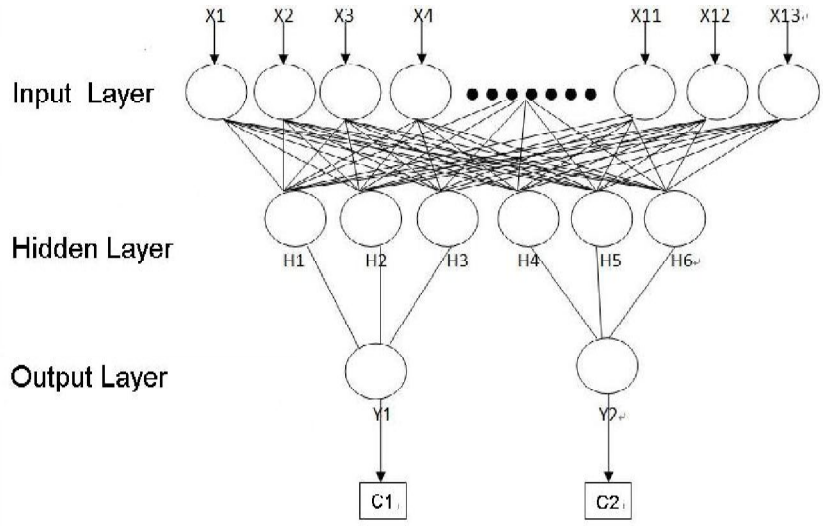

Fig 2: ANN Architecture [4]

II. LITERATURE REVIEW

Dimitrios H. Mandarins et al. (2008) presented ANN models in terms of their categorization effectiveness in an orthopaedic disease, namely osteoporosis. Osteoporosis risk detection may be viewed as a pattern classification problem, based on a set of clinicaldata. MLPs and PNNs were used in order to face the osteoporosis risk factor detection. The obtained results give conclusion that the PNNs do better than to MLPs[1].

Bhuvaneswari Amma N.G. (2011) presented for predicting the risk of cardiovascular disease. This system is built by combining the relative advantages of genetic algorithm and neural network. Multilayered feed forward neural networks are particularly suited to complex classification problems. The weights of the neural network are determined using genetic algorithm because it finds acceptably good set of weights in less number of iterations. The dataset provided by University of California, Irvine (UCI) machine learning repository is used for training and testing. It consists of 303 instances of heart disease data each having 14 attributes including the class label. First, the dataset is pre-processed in order to make them suitable for training. Genetic based neural network is used for training the system. The final weights of the neural network are stored in the weight base and are used for predicting the risk of cardiovascular disease. The classification accuracy obtained using this approach is 94.17%[2].

Jasdeep Singh Bhalla et al. (2012) proposed two different artificial neural networks for disease diagnosis, which uses Scaled Conjugate gradient back propagation and Levenberg-Marquardt back propagation algorithm for training the neural networks. The proposed model has been tested on a dataset about Thyroid disease collected from a local hospital. These samples are first trained using Levenberg-Marquardt propagation and outcomes are measured, then the same samples are trained by means of Scaled Conjugate gradient back propagation algorithm and results are noted. The algorithm used is capable of distinguishing amongst infected person or non-infected person. The results fromthe two models are compared and analysed to show theefficiency of prediction by ANNs in medical diagnosis [3].

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AH Chen et al. (2011) developed a heart disease diagnosis system that can help medical professionals in diagnosis heart disease status based on the patientsdata. These approaches consist of three steps. Firstly, they selected 13 important clinical features as input , i.e., age, sex, chest pain type, treetops, cholesterol, fasting blood sugar, resting ecg, max heart rate, exercise induced angina, old peak, slope, number of vessels collared, and that. Secondly, they created ANN algorithm for classifying heart disease based on these clinical features. The accuracy of diagnosis is nearly 80%. Finally, they gave user-friendly heart disease predict system[4].

Peter McLeod et al. (2014) evaluate the number of neurons for candidate networks and the number of committee members in their research on variable neural classifiers for breast cancer detection. These work reports that good neural network accuracy can be obtained with a small number of neurons in the hidden layer and three committee members in the ensemble. The proposed methodology is tested on two benchmark databases by obtaining 99% classification accuracy[5].

Jayshril S. Sonawane et al. (2014) presented a diagnosis system for heart disease by the help of multilayer perceptron neural network. The neural network in this system takes 13 clinical features and it is trained using back-propagation algorithm to predict that there is a presence or absence of heart disease in the patient with highest accuracy of 98% comparative to other convetional systems. The accuracy thus achieved with this system shows that it is better and efficient than other systems[6].

Aiguo Wang et al. (2014) put forward to integrate logistic regression analysis and Artificial Neural Networks (ANNs) model for the selection of risk factors and the prediction of chronic diseases by taking a case study of hypertension. First, binary logistic regression model was applied on experimental dataset collected from Behaviour Risk Factor Surveillance System (BRFSS) to select factors statistically significant to hypertension in terms of the predefined *p*-value. Then, a Multi-Layer Perception (MLP) neural network model with Back Propagation (BP) algorithm was constructed and trained for the prediction of hypertension with the selected risk factors as inputs to ANNs. Experimental results showed that our proposed approach achieved more than 72% prediction accuracy acceptable in the diagnosis of hypertension and that the Area Under the receiver-operator Curve (AUC) was more than 0.77. The results indicate that integration of logistic regression and artificial neural networks provides us an effective method in the selection of risk factors and the prediction of hyper tension, as well as a general approach for the prediction of other chronic diseases[7].

Sana Bharti et al. (2015) studied several algorithms (like genetic algorithm, Particle Swarm Optimization, Artificial Neural Network) which play very essential role in determining or predicting heart disease. Here they firstly described the basic concepts of these three algorithms, and analyse how these algorithms helps in prediction of heart diseases. The main objective was to study various algorithms that can be used to predict the heart disease and compare them to find out the best method of prediction of disease[8].

Dr. S. Vijayarani et al.(2015) predicted kidney diseases by using Support Vector Machine (SVM) and Artificial Neural Network (ANN).The goal of research is to measure performance of these two algorithms on the basis of its accuracy and execution time by comparing these two algorithm. The results it show that the performance of the neural Newtork is better than the any other algorithm [9].

M. Akhil Jabbar et al. (2013) introduced a classification approach which uses ANN and feature subset selection for the classification of heart disease. PCA is used for pre-processing and to reduce no. of attributes which indirectly reduces the no. of diagnosis tests which are needed to be taken by a patient. They applied their approach on Andhra Pradesh heart disease data base. Their experimental results show that accuracy improved over traditional classification techniques. This system is feasible and faster and more accurate for diagnosis of heart disease[10].

Javad Kojuri et al.(2015) were enrolled A total of 935 cardiac patients with chest pain and no diagnosticelectrocardiogram (ECG) and followed for 2 weeks in two groups based on the appearance of myocardial infarction. Two types of data were used for all patients: nominal (clinical data) and quantitative (ECG findings). Two

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different artificial neural networks – radial basis function (RBF) and multi-layer perceptron (MLP) – were used to classify the two groups. Result described that The RBF neural network had an accuracy of 83% with ECG findings and an accuracy of 78% with clinical features. When clinical data were used in an MLP neural network trained with a genetic algorithm, ECG results led to a classification accuracy of 96% and clinical data yielded an accuracy of 84.5%. Both neural network structures predicted MI within about 2 weeks of hospital referral with an acceptable degree of accuracy in patients with non-diagnostic ECG. The MLP neural network significantly outperformed the RBF network because of the use of the genetic algorithm, which provided a global strategy to accurately determine MLP weights[11].

Dr. K. Nageswara Rao et al. (2014) enhanced the training procedure of the neural network to diagnose the heart disease effectively, they used a hybrid algorithm which was combination of GSO and ABC. Initially, they generated an initial population that has number of members and the members have the weight values which were used to train the neural network. To identify a perfect member to train the neural network, they used the hybrid algorithm operations. And given each member to the neural network by them and they found the fitness for each member and they categorized the members to perform the hybrid operations i.e. which member has to do which operation. After performing corresponding operations on the categorized members, they got a new set of members and they iterated the process until they got as table member for producer operation. They selected the weight values of the producer to train the neural network to detect the heart disease[12].

Lara Dantas et al. (2015) studied to use neural networks such as Multi-layer Perceptron, Extreme learningMachine and Reservoir computing for performing early diagnosis of a patient with or without AD and Mild CognitiveImpairment (MCI), and for another common type of disease. This paper also give detail to utilize the Random Forest Algorithmand the feature selection method available on Weka called Info Gain Attribute Eval to select proteins from the originalset and, thus, make a new protein signature. Through experiments result show that the best performance was obtained with the MLP and the new signatures created with the RandomForest achieved better results than any other system[13].

Tijjani Adam et al. (2012) contained a report on a very simple functional model of Artificial Neural Networks, the article is proposed to aid current pre-clinical patient diagnosis methods. The study investigated the use of Artificial Neural Networks in predicting the kidney problems symptom through comparing mental behaviour of different patients. Images were taught to the network through the matrix algorisms they generated and implemented using Mat lab software. They did testing on 10samples, 2 for each case, which successfully identified each sample according to facial information trained to identify. This study demonstrate that the proposed approach could be used as method of patient for prediction of various diseases especially in provision of initial care for an illness[14].

Vaibhav Narayan Chunekar et al. (2009) introduced problem with physician fatigue and severity of problem across world of taking decision of cancer cell is benign or malignant one. Next, introduced worldwide failure cases of breast cancer with need of neural network to diagnose the problem. Number of researchers did variety of research on WDBC database. This paper emphasis on the use of Jordan Elman Neural Network approach on three different database of breast cancer viz. Wisconsin, WDBC and WPBC. They also introduced recurrent neural network technology as Jordan Elman Neural Network. To diagnose problem Jordan Elman Neural Network was successful on three different breast cancer data set was major feature of this paper[15].

Ishwinder Kaur Sandhu et al. (2014) presented the use of neural networks in diagnosis of cancer has been described with special reference to breast cancer detection using a cloud computing model. The paper also provides an overview of the different types of software's used in cloud computing and how the utilization of neural network structures improves the medication and diagnosis of cancer in early stages[16].

Koushal Kumar et al. (2012) did research on kidney stone disease diagnosis by utilizing three different neural network algorithms which have different architecture and characteristics. The goal of this research was to compare the performance of all three neural networks on the basis of its accuracy, time taken to build model, and training data set size. They used Learning vector quantization (LVQ), two layers feed forward perceptron trained with back propagation training algorithm and Radial basis function (RBF) networks for diagnosis of kidney stone disease. In this research they used Waikato Environment for Knowledge Analysis (WEKA) version 3.7.5 as simulation tool and it is

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an open source tool. The data they used for diagnosis is real world data with 1000 instances and 8 attributes. In the end part they checked the performance comparison of different algorithms to propose the best algorithm for kidney stone diagnosis. So that would helps in early identification of kidney stone in patients and reduces the diagnosis time [17].

Punam Suresh Pawar et al. (2012) used backpropagation neural network for classification of breast cancer with different neuron models. It can assist doctors for taking correct decisions. From experimental results they concluded that when they remove missing value attributes form original database and use it in back propagation neural network they got better results than reference paper. Also as they were increasing number of neurons, accuracy is getting increased and for 9 it is 99%[18].

F. Paulin et al. (2010) investigated the potential of applying the feed forward neural network architecture for the classification of breast cancer. Back-propagation algorithm is used for training multi-layer artificial neural network. Missing values are replaced with median method before the construction of the network. This paper presents the results of a comparison among ten different hidden neuron initialization methods. The classification results have indicated that the network gave the good diagnostic performance of 99.28%[19].

Preeti Gupta et al. (2014) proposed the enhancement of the accuracy of the results by using Artificial Neural Network optimized with Genetic Algorithm in prediction of heart disease diagnosis with UCI dataset. In this study neural network was optimized with Genetic Algorithm and proved experimentally. The trained feed forward neural network and fitting neural network were optimized with genetic algorithm and was then compared with the scale conjugate gradient descent back-propagation algorithms trained feed forward neural network and fitting neural network respectively for the accuracy enhancement percentage. The proposed learning was much faster and accurate as compared to the other one. The proposed learning was designed and developed by using MATLAB GUI feature. The proposed method achieved an accuracy of 97.83%. With this higher achieved accuracy the heart disease can be diagnosed more accurately and much proper treatments can be suggested[20].

Hasan Temurtas et al. (2008) worked on a comparative Pima diabetesdisease diagnosis . For this reason , a multilayer neural network structure which was trained by Levenberg–Marquardt (LM) algorithm and a probabilistic neural network structure were utilezed by them. The results of these research were compared with the results of the previous studies reported focusing on diabetes disease diagnosis and utilizing the same UCI database [21].

Abdullahi Uwaisu Muhammad et al.(2015) reported a brief survey on various techniques for application of artificial neural networks and the different learning in neural networks, such as supervised, unsupervised, reinforced and competitive learning it also give details of the major advantages and their drawbacks. In order to measure the perfect, efficient solutions for artificial neural networks has been widely used [22].

III. ISSUES IN ANN FOR DIAGNOSIS

Modelling issues that affect the performance of an ANN must be considered carefully. One critical decision is to determine the appropriate architecture, *that* is the number of layers, the number of nodes in Each layer, and the number of arcs which interconnect with the nodes Other network design decisions include the selection of activation functions of the hidden and output nodes, the training algorithm, data transformation or normalization methods, training and test sets, and performance measures. In this paper we survey the above-mentioned modelling issues of a neural network diagnosis[23].

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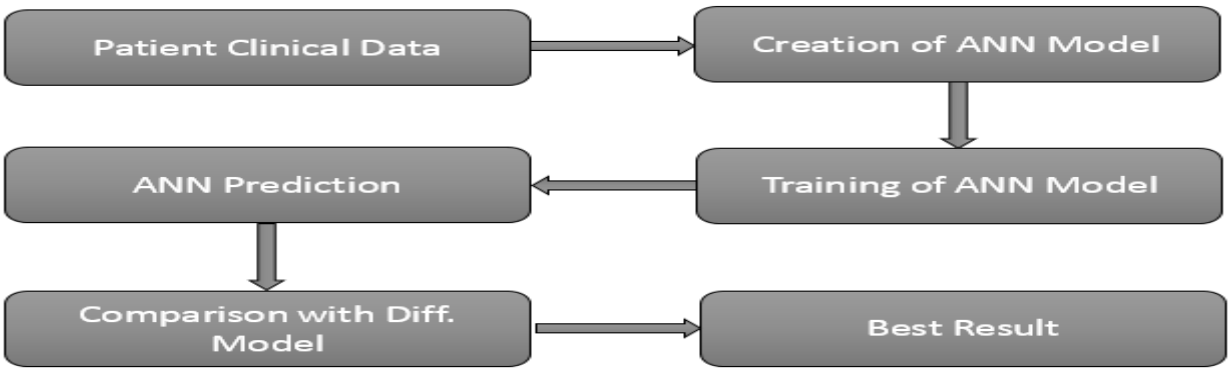

Fig 2 :: Workflow of research in ANN for medical field

IV. CONCLUSION AND FUTURE WORK

This paper reports a detailed survey on Disease Diagnosis using different neural network architecture. From the survey it has been found that most of the researchers used Levenberg Marquand back propagation algorithm for disease Diagnosis and got significant results. The survey also gives a conclusion that the disease-diagnosis techniques that use MLP, BPN, RBFN, LVQ, SOM and SVM are suitable to predict than other decision support system such as statistical and numerical methods. However some limitation of those methods has been found. The extensive references in support of the different developments of ANN research provided with the paper should be of great help to ANN researchers to accurately predict presence or absence of heart disease in the patient. In future, want to predict that there is a presence or absence of various disease in the patient with highest accuracy comparative to other systems by using multilayer perceptron Network (MLP) with Levenberg Marquardt backpropogation algorithm.

REFERENCES

1. Dimitrios H. Mantzaris, George C. Anastassopoulos and Dimitrios K. Lymberopoulos," MedicalDisease Prediction Using Artificial Neural Networks".
2. BhuvaneswariAmma N.G.," Cardiovascular Disease Prediction System using Genetic Algorithm and Neural Network".
3. Jasdeep Singh Bhalla, AnmolAggarwal ," Novel Method for Medical Disease Diagnosis Using Artificial Neural Networks Based on Backpropagation Algorithm".
4. AH Chen, SY Huang, PS Hong, CH Cheng, EJ Lin,"HDPS: Heart Disease Prediction System".
5. Peter Mc Leod, Brijesh Verma, Mengjie Zhang," Optimizing Configuration of Neural Ensemble Network for Breast Cancer Diagnosis",2014 International Joint Conference On Neural Network(IJCNN) July 6-11, 2014, Beijing, China.
6. Jayshril S. Sonawane, D. R. Patil," Prediction of Heart Disease Using Multilayer Percept Neural Network", ICICES2014 S.A.Engineering College, Chennai, Tamil Nadu, India.
7. Aiguo Wang, Ning An, Yu Xia, Lian Li, Guilin Chen,"A Logistic Regression and Artificial Neural Network-based Approach for Chronic Disease Prediction: a Case Study of Hypertension**",** 2014 IEEE International Conference on Internet of Things (iThings 2014), Green Computing and Communications(GreenCom 2014), and Cyber-Physical-Social Computing (CPSCom 2014).
8. Sana Bharti, Dr.Shaliendra Narayan Singh," Analytical Study of Heart Disease Prediction Comparing With Different Algorithms", International Conference on Computing, Communication and Automation (ICCCA2015).
9. *Dr. S. Vijayarani, Mr.S.Dhayanand, M.Phil*," KIDNEY DISEASE PREDICTION USING SVM AND ANN ALGORITHMS", International Journal of Computing and Business Research (IJCBR) ISSN (Online) : 2229-6166 Volume 6 Issue 2 March 2015.
10. M. AkhilJabbar, B.L Deekshatulu&Priti Chandra," Classification of Heart Disease using Artificial Neural Networkand Feature Subset Selection",Global Journal of Computer Science and Technology Neural & Artificial Intelligence, Volume 13 Issue 3 Version 1.0 Year 2013
11. JavadKojuri, Reza Boostani, PooyanDehghani, FarzadNowroozipour, Nasrin Saki," Prediction of acute myocardial infarction with artificial neural networks in patients with nondiagnostic electrocardiogram ".
12. B.Srinivasa Rao, Dr. K. Nageswara Rao, Dr. S. P. SETTY," An Approach for Heart Disease Detection byEnhancing Training Phase of Neural NetworkUsing Hybrid Algorithm.
13. Lara Dantas, M^euserValenc, a," Using neural networks in the identification of signatures for prediction of Alzheimer's Disease", 2014 IEEE 26th International Conference on Tools with Artificial Intelligence.
14. Tijjani Adam and U. Hashim, U. S. Sani," Designing an Artificial Neural Network Model for the Prediction of Kidney problems symptom through patient's metal behavior for pre- clinical medical Diagnostic", 2012 International Conference on Biomedical Engineering (ICoBE),27-28 February2012,Penang.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 9, September 2015

15. Vaibhav Narayan Chunekar, Hemant P. Ambulgekar," Approach of Neural Network to DiagnoseBreast Cancer on three different Data Set", 2009 International Conference on Advances in Recent Technologies in Communication and Computing.
16. Meera NairSardul Singh Sandhu,"DIAGNOSIS OF CANCER USING ARTIFICIAL NEURAL NETWORK AND CLOUD COMPUTINGAPPROACH".
17. KoushalKumar,Abhishek ," Artificial Neural Networks for Diagnosis of Kidney StonesDisease ", *I.J. Information Technology and Computer Science*, 2012, 7, 20-5.
18. Punam Suresh Pawar, DharmarajPatil," Breast Cancer Detection Using Backpropagation Neural Network with Comparison Between Different Neuron", 2012 2nd IEEE International Conference on Parallel, Distributed and Grid Computing.
19. F. Paulin, Dr.A.Santhakumaran, "Back Propagation Neural Network by Comparing HiddenNeurons: Case study on Breast Cancer Diagnosis", *International Journal of ComputerApplications (0975 – 8887) Volume 2 – No.4, June 2010.*
20. Preeti Gupta,BikrampalKaur,"Accuracy Enhancement of Artificial Neural Network using Genetic Algorithm**",***International Journal of Computer Applications (0975 – 8887) Volume 103 – No 13, October 2014.*
21. HasanTemurtas, NejatYumusak, FeyzullahTemurtas," A comparative study on diabetes disease diagnosis using neural networks", Expert Systems with Applications 36 (2009) 8610–8615.
22. AbdullahiUwaisu Muhammad, AbdullahiGarba Musa, Kamaluddeen Ibrahim Yarima ," Survey on Training Neural Networks", International Journal of Advanced Research in Computer Scienceand Software Engineering , Volume 5, Issue 3, March 2015 ISSN**: 2277 128X.**
23. Guoqiang Zhang, B. Eddy Patuwo, Michael Y. Hu," Forecasting with artificial neural networks:The state of the art", International Journal of Forecasting 14 (1998) 35–62

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