ISSN: 2321-9653

INTERNATIONAL JOURNAL FOR RESEARCH IN APPLIED SCIENCE AND ENGINEERING TECHNOLOGY (IJRASET)

Using Neural Networks in Medical Diagnosis Analysis Improvement

Niyati Shukla [1], Aparna Dubey[2], Dr.Vishnu Kumar Mishra[3]

[1]*Dr.C.V.RAMAN UNIVERSITY, BILASPUR, INDIA,*
MPHIL SCHOLAR

[2]*Dr.C.V.RAMAN UNIVERSITY, BILASPUR, INDIA,*
PHD SCHOLAR

ASSOCIATE PROFESSOR
DEPTT.OF ENGINEERING (CSE)
[3]*RSR RUNGTA COLLEGE OF ENGINEERING & TECHNOLOGY, BHILAI (C.G)*

Abstract: ***The main objective of this research work is to improved Neural networks involve long training times, and are therefore more suitable for applications where this is feasible. They require a number of parameters which are typically best determined empirically, such as the network topology or "structure". Neural networks have been criticized for their poor interpretability, since it is difficult for humans to interpret the symbolic meaning behind the learned weights. These features initially made neural networks less desirable for data mining. Advantages of neural networks, however, include their high tolerance to noisy data as well as their ability to classify patterns on which they have not been trained. In addition, several algorithms have recently been developed for the extraction of rules from trained neural networks. These factors contribute towards the usefulness of neural networks for classification in data mining. The most popular neural network algorithm is the back propagation algorithm, proposed in the 1980's. Back propagation learns by iteratively processing a set of training samples, comparing the network's prediction for each sample with the actual known class label. For each training sample, the weights are modified so as to minimize the mean squared error between the network's prediction and the actual class.***

These modifications are made in the "backwards" direction, i.e., from the output layer, through each hidden layer down to the first hidden layer (hence the name back propagation). Although it is not guaranteed, in general the weights will eventually converge, and the learning process stops. Initialize the weights - The weights in the network are initialized to small random numbers (e.g., ranging from -1.0 to 1.0, or -0.5 to 0.5). Each unit has a zero or more bias associated with it. The biases are similarly initialized to small random numbers. Each training sample, X, is then processed.

Keywords: Health Care, Natural language processing, Fuzzy Logic, Classification, Intelligent Decision Support System, Identifying patients, diagnosis.

I.INTRODUCTION

An expert system is a computer program that simulates the judgment and behavior of a human or an organization that has expert knowledge and experience in a particular field. Typically, such a system contains a knowledge base containing accumulated experience and a set of rules for applying the knowledge base to each particular situation that is described to the program. Sophisticated expert systems can be enhanced with additions to the knowledge base or to the set of rules. Among the best-known expert systems have been those that play chess

and that assist in medical diagnosis. Decision support tools and a standard framework for the exchange of health information, over inexpensive Internet communication pathways using web-based technologies. Wrong Diagnosis which is part of Health Grades network and Web [1] whose slogan is "Better Information, Better Health" are another two efficient online diagnosis tools. There are many online diagnosis tool in the web, but proposed system is the most user friendly (easy to use), precise, at the same time accurate. In the web, some systems are so boring -needs to give lots of information, give answers to lots of question which is quite monotonous. In most of the other online diagnosis websites, the sequence of questions is fixed. But in the proposed system one needs to give minimal information, questions will be asked after filtering at every step based on your responses and at every step the problem domain will become narrower to reach a perfect diagnosis. he/she might have, the problem area/problem, the expert system gives some symptom from which the user needs to select symptoms, based on the selection of symptoms the user is asked some questions, according to the answer selection the expert system diagnosis diseases. Research medicine industry needs to be a part of technology more than others. People in this sector have to read and learn lots of information and details about health to put them into practice while they are student. However, it is crucial that they have to keep all information in their mind [2]. Of course it is impossible but the computers can always save all information in their memories. It also seems that very early on, scientists and doctors alike were captivated by the potential such a technology might have in Medicine. With intelligent computers able to store and process vast stores of knowledge, the hope was that they would become perfect doctors, assisting or surpassing clinicians with tasks like diagnosis. Expert systems are the commonest type of AIM (Artificial Intelligence in Medicine) system in routine clinical use. They contain medical knowledge, usually about a very specifically defined task, and are able to reason with data from individual patients to come up with reasoned conclusions. Although there are many variations, the knowledge within an expert system is typically represented in the form of a set of rules [3]. Our target is the technology to place in the medicine industry practically. It is one of the sectors that have to have minimum margin of error. Although it is challenging to write and execute the program by minimizing the error margin, when we combine the forces of technology and human it will be perfect. [4].

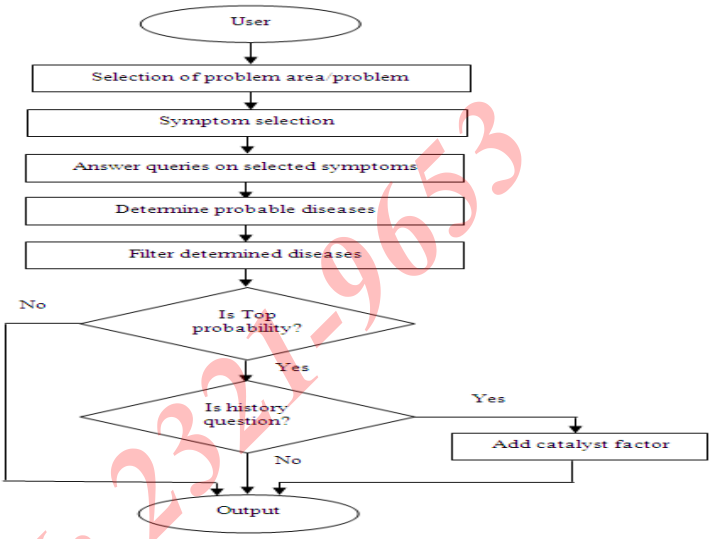


Figure.1.Flow Diagram of the Proposed System.

II.RELETED WORK

(A) NEURAL NETWORKS IN MEDICINE

Artificial Neural Networks (ANN) is currently a 'hot' research area in medicine and it is believed that they will receive extensive application to biomedical systems in the next few years. At the moment, the research is mostly on modeling parts of the human body and recognizing diseases from various scans (e.g. cardiograms, CAT scans, ultrasonic scans, etc.)[5].Neural networks are ideal in recognizing diseases using scans since there is no need to provide a specific algorithm on how to identify the disease. Neural networks learn by example so the details of how to recognize the disease are not needed. What is needed is a set of examples that are representative of all the variations of the disease. The quantity of examples is not as important as the 'quantity'. The examples need to be selected very carefully if the system is to perform reliably and efficiently [6].

(B) MODELLING AND DIAGNOSING THE CARDIOVASCULAR SYSTEM.

Neural Networks are used experimentally to model the human cardiovascular system. Diagnosis can be achieved by building a model of the cardiovascular system of an individual and comparing it with the real time physiological measurements taken from the patient. If this routine is carried out regularly, potential harmful medical conditions can be detected at an early stage and thus make the process of combating the disease much easier [7].A model of an individual's cardiovascular system must mimic the relationship among physiological variables (i.e., heart rate, systolic and diastolic blood pressures, and breathing rate) at different physical activity levels. If a model is adapted to an individual, then it becomes a model of the physical condition of that individual. The simulator will have to be able to adapt to the features of any individual without the supervision of an expert. This calls for a neural network. Another reason that justifies the use of ANN technology, is the ability of ANNs to provide sensor fusion which is the combining of values from several different sensors. Sensor fusion enables the ANNs to learn complex relationships among the individual sensor values, which would otherwise be lost if the values were individually analyzed. In medical modeling and diagnosis, this implies that even though each sensor in a set may be sensitive only to a specific physiological variable, ANNs are capable of detecting complex medical conditions by fusing the data from the individual biomedical sensors [8].

(C) ELECTRONIC NOSES

ANNs are used experimentally to implement electronic noses. Electronic noses have several potential applications in telemedicine. Telemedicine is the practice of medicine over long distances via a communication link. The electronic nose would identify odours in the remote surgical environment. These identified odours would then be electronically transmitted to another site where an door generation system would recreate them. Because the sense of smell can be an important sense to the surgeon, telesmell would enhance telepresent surgery [9].

(D) INSTANT PHYSICIAR

An application developed in the mid called the "instant physician" trained an auto associative memory neural network to store a large number of medical records, each of which includes information on symptoms, diagnosis, and treatment for a particular case. After training, the net can be presented with input consisting of a set of symptoms; it will then find the full stored pattern that represents the "best" diagnosis and treatment.

(E)Automatically alerts and reminders.

In so called real time situations, an expert system attached to a monitor can warn of changes in a patient's condition. In less acute circumstances, it might scan laboratory test results or drug orders and send reminders or warnings through an e-mail system [10].

(F) Analysis of Diagnostic system.

When a patient's case is complex, rare or the person making the diagnosis is simply inexperienced, an expert system can help come up with likely diagnoses based on patient data.

(G)Treatment Plan

Systems can either look for inconsistencies, errors and omissions in an existing treatment plan, or can be used to formulate a treatment based upon a patient's specific condition and accepted treatment guidelines.

(H) Software Agents Retrieval Technique

Software 'agents' can be sent to search for and retrieve information, for example on the Internet, which is considered relevant to a particular problem. The agent contains knowledge about its user's preferences and needs, and may also need to have medical knowledge to be able to assess the importance and utility of what it finds automatically interpreted [11].

(I) Image recognition and interpretation:

Many medical images can now be automatically interpreted, from plane X-rays through to more complex images like angiograms, CT and MRI scans. This is of value in mass-screenings, for example, when the system can flag potentially abnormal images for detailed human attention.

Natural Language Processing is a field of computer science and linguistics concerned with the interactions between computers and human (natural) languages natural language

processing is a very attractive method of human computer Interaction [12]. Natural language understanding is sometimes referred to as an AI complete problem because it seems to require extensive knowledge about the outside world and the ability to manipulate it. Whether NLP is distinct from, or identical to, the field of computational linguistics is a matter of perspective [13].The combination of defines latter focused on the theoretical aspects of NLP. On the other hand, the open-access journal "Computational Linguistics", styles itself as the longest running publication devoted exclusively to the design and analysis of natural language processing systems especially statistical machine learning. Research into modern statistical NLP algorithms requires an understanding of numbers different fields, including linguistics, computer science, and statistics operations [14, 15].

III.PURPOSE of RESEARCH

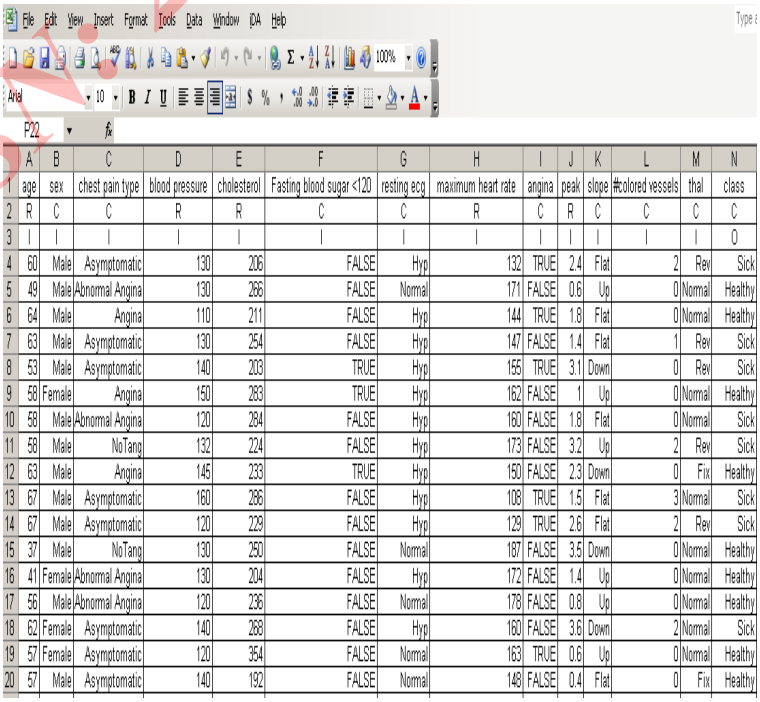
Research and Application Challenges

1.The main objective of this experiment is to perform neural network based unsupervised learning on cardiology database so that interesting relationship or knowledge patterns among the dataset can be find out.
2.We can provide optimized answers to a medical problem which is precised, partial true and uncertain.

IV. EXPERIMENT and IMPLEMENTATION

The database used for this experiment Cardiology Database collected from UCI Repository of machine learning database. In order to perform experiment using iDA the cardiology dataset for the experiment was converted Excel Format i.e. .xls file. Then it is loaded into MS-EXCEL as iDA is MS-EXCEL based data mining tool. This dataset is consisted of 303 patients pertaining to cardiology data. In supervised learning the network is trained using a set of input-output pairs. The goal is to 'teach' the network to identify the given input with the desired output. For each example in the training set, the network receives an input and produces an actual output. After each trial, the network compares the actual with the desired output and corrects any difference by slightly adjusting all the weights in the network until the output produced is similar enough to the desired output, or the network cannot improve its performance any further [16].

In unsupervised learning the network is trained using input signals only. In response, the network organizes internally to produce outputs that are consistent with a particular stimulus or group of similar stimuli. Inputs form clusters in the input space, where each cluster represents a set of elements of the real world with some common features. In both cases once the network has reached the desired performance, the learning stage is over and the associated weights are frozen. The final state of the network is preserved and it can be used to classify new, previously unseen inputs [16]. At the testing stage, the network receives an input signal and processes it to produce an output. If the network has correctly learnt, it should be able to generalize, and the actual output produced by the network should be almost as good as the ones produced in the learning stage for similar inputs.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	age	sex	chest pain type	blood pressure	cholesterol	Fasting blood sugar <120	resting ecg	maximum heart rate	angina	peak	slope	#colored vessels	thal	class
2	R	C	C	R	R	C	C	R	C	R	C	C	C	C
3	I	I	I	I	I	I	I	I	I	I	I	I	I	O
4	60	Male	Asymptomatic	130	206	FALSE	Hyp	132	TRUE	2.4	Flat	2	Rev	Sick
5	49	Male	Abnormal Angina	130	266	FALSE	Normal	171	FALSE	0.6	Up	0	Normal	Healthy
6	64	Male	Angina	110	211	FALSE	Hyp	144	TRUE	1.8	Flat	0	Normal	Healthy
7	63	Male	Asymptomatic	130	254	FALSE	Hyp	147	FALSE	1.4	Flat	1	Rev	Sick
8	53	Male	Asymptomatic	140	203	TRUE	Hyp	155	TRUE	3.1	Down	0	Rev	Sick
9	58	Female	Angina	150	283	TRUE	Hyp	162	FALSE	1	Up	0	Normal	Healthy
10	58	Male	Abnormal Angina	120	284	FALSE	Hyp	160	FALSE	1.8	Flat	0	Normal	Sick
11	58	Male	NoTang	132	224	FALSE	Hyp	173	FALSE	3.2	Up	2	Rev	Sick
12	63	Male	Angina	145	233	TRUE	Hyp	150	FALSE	2.3	Down	0	Fix	Healthy
13	67	Male	Asymptomatic	160	286	FALSE	Hyp	108	TRUE	1.5	Flat	3	Normal	Sick
14	67	Male	Asymptomatic	120	229	FALSE	Hyp	129	TRUE	2.6	Flat	2	Rev	Sick
15	37	Male	NoTang	130	250	FALSE	Normal	187	FALSE	3.5	Down	0	Normal	Healthy
16	41	Female	Abnormal Angina	130	204	FALSE	Hyp	172	FALSE	1.4	Up	0	Normal	Healthy
17	56	Male	Abnormal Angina	120	236	FALSE	Normal	178	FALSE	0.8	Up	0	Normal	Healthy
18	62	Female	Asymptomatic	140	268	FALSE	Hyp	160	FALSE	3.6	Down	2	Normal	Sick
19	57	Female	Asymptomatic	120	354	FALSE	Normal	163	TRUE	0.6	Up	0	Normal	Healthy
20	57	Male	Asymptomatic	140	192	FALSE	Normal	148	FALSE	0.4	Flat	0	Fix	Healthy

Figure 2.: Cardiology Dataset loaded into MS- EXCEL for iDA Data Mining Session

there are no categorical attribute values necessary and sufficient for Class 2. Also, chest pain type values Asymtomatic and Abnormal Angina are highly sufficient for in Class 1.

Finally, Fasting blood sugar = False highly necessary Class 2 attribute values.

A1 Class:

	A	B	C	D
47	Attribute Values Necessary and Sufficient for Class Membership:	Name	Value	
48		class	Sick	
49				
50	Attribute Values Highly Sufficient for Class Membership:	Name	Value	
51		#colored vessels	2	
52		#colored vessels	3	
53				
54	Attribute Values Highly Necessary for Class Membership:	Name	Value	
55		sex	Male	
56		Fasting blood sugar <120	FALSE	
57				
58	Numerical Value Attribute Summary:	Name	Mean	Standard Deviation
59		age	56.601	7.962
60		blood pressure	134.399	18.73
61		cholesterol	251.087	49.455
62		maximum heart rate	139.101	22.599
63		peak	1.586	1.3
64				

Figure 3: summary of necessary and sufficient attribute-value information

Today's clinical databases store detailed information about patient diagnoses, lab test results and details from patient treatments, a virtual gold mine of information for medical researchers. Utilizing neural network based unsupervised learning with medical treatment data is a virtually unexplored frontier. A comparative unsupervised learning helps uncovering the valuable knowledge hidden behind them and aiding the decision makers to improve the healthcare services.

V. RESULT

Treatment records of millions of patients can be stored and computerized and data mining techniques may help in answering various important and critical questions related to healthcare. The research studies on healthcare management aim both to control the increasing rates and to increase the accessibility level for healthcare services. The results of the experiment shows that fuzzy logic integrated knowledge discovers on immunization data helps decision makers to improve the efficiency of Immunization Programmers in Indian States, by proper monitoring and categorization of the healthcare centers, supervisions of health schemes, and their performances [13,14].

VI. CONCLUSION

Treatment records of millions and billions of patients can be stored and computerized. Data mining techniques may be very helpful in answering several important and critical questions related to healthcare. The research studies on healthcare management aim both at controlling the continuously increasing costs and also increases the accessibility level of all healthcare services. The proposed work shows the great potential to discover knowledge pattern from massive healthcare data. A new problem we faced while trying to test out new idea dealing with finding the group of patients suffering from similar disease was in inherent limitation of the available data, because we accessed only limited sources, our results & experiments no doubt reflect some bias. Much of the work published in this domain also suffers from the fact that it tries to reach general conclusion using very small data sets collected on a local scale. The results of the experiment shows that fuzzy logic integrated knowledge discovery on immunization data helps decision makers to improve the efficiency of Immunization Programmers in Indian States by proper monitoring and categorization of the healthcare centers, and proper supervisors of health schemes, and their performances [14].

VII. APPLICATION OF NEURAL NETWORKS

Given this description of neural networks and how they work, what real world applications are they suited for? Neural networks have broad applicability to real world business proble1ms. In fact, they have already been successfully applied in many industries.

Since neural networks are best at identifying patterns or trends in data, they are well suited for prediction or forecasting needs including:

(1) Sales forecasting
(2) Industrial process control
(3) Customer research
(4) Data validation
(5) Risk management
(6) Target marketing

But to give you some more specific examples; ANN are also used in the following specific paradigms: recognition of speakers in communications; diagnosis of hepatitis; recovery of telecommunications from faulty software; interpretation of multi meaning Chinese words; undersea mine detection; texture analysis; three-dimensional object recognition; hand-written word recognition; and facial recognition.

VIII. FUTURE WORK

Medical diagnosis is one of the major problem in medical application. This includes the limitation of human experiments in diagnosing diseases manually. This experiment had found that clustering techniques can help them to improve this domain. Identifying patients suffering from common diseases is main aspect of medical diagnosis.

REFERENCES

[1]Tarun Dhar Diwan,Rachna verma "Intelligence Technique for medical diagnosis analysis using artificial approach", internation journal for advance research in engineering and technology, aug 2013, vol. 1,Issuevii,ISSN 2320-6802.

[2]Bourlas, P., Giakoumakis, E., and Papakonstantinou, G. (1999). "A Knowledge Acquisition and management System for ECG Diagnosis". Machine Learning and Applications: Machine Learning in Medical Applications.

[3] Brachman, R., and Anand, T. 1996. The Process of Knowledge Discovery in Databases: A Human-Centered Approach. In Advances in Knowledge Discovery and Data Mining.

[4] Breiman et al., 1984 "Classification and Regression Trees". Wadsworth International Group, Belmont, CA.

[5] Brin S., Motwani R., Ullman J. D., Tsur S. Dynamic itemset counting and implication rules for market basket data. ACM SIGMOD Record, 1997, vol. 26.

[6] B. Wuthrich. "Knowledge Discovery in Databases". Technical Report CS-95-4, The Hong Kong University of Science & Technology,1995.

[7] Chae Y. M., Kim H. S., Tark K. C., Park H. J., Ho S. H., Analysis of healthcare quality indicator using data mining and decision support system. Expert Systems with Applications, 2003, 167–172.

[8] Child Ch., Stathis K., The Apriori Stochastic Dependency Detection (ASDD) Algorithm for Learning Stochastic Logic Rules. J. Dix, J. Leite, and P. Torroni (eds), 2004, Proceedings of the 4th International Workshop on Computation, 201- 216.

[9] Cios K., Moore G., Uniqueness of Medical Data Mining. Artificial Intelligence in Medicine, 2002, vol. 26, 1-24.

[10] Coiera E., A Guide to Health Informatics. 2nd edition, Hodder Arnold, 2003.

[11] Comak E., Arslan A., Turkoglu I., A decision support system based on support vector machines for diagnosis of the heart valve diseases. Elsevier, 2007, vol. 37, 21-27.

[12] Cosic D., Loncaric S., Rule-based labeling of CT head image. Lecture Notes in Artificial Intelligence, Berlin, Germany, Springer-Verlag, 1999, vol. 1211, 453– 456.

[13] Creswell J. W., Research Design, Qualitative, Quantitative and Mixed Method Approached. 2nd edition, Sage Publications, Thousands Oaks CA, 2002.

[14] Cunningham P., Carney J., Jacob S., Stability problems with artificial neural networks and the ensemble solution. Artificial Intelligence in Medicine, 2000, vol. 20, no. 3, 217–225.

[15]Tarun Dhar Diwan "Effective Fuzzy Clustering Technique in Intelligent Decision Support System" CiiT - International Journal of Artificial Intelligent Systems and Machine Learning, Issue: August 2012 , ISSN: 0974–9543, DOI: AIML082012007

[16]Tarun Dhar Diwan, Kamal Mehta "Application of Clustering Techniques Using Health Care Management " International Conference on Emerging Trends in Engineering, IEEE-February 20-21,2010, pages 143-148, ISBN:978-81-910130-0-9 Dr.J.J Magdum College of Engineering, jaysingpur Dist Kolapur, Maharashtra, INDIA