PREDICTING PERIODONTAL DISEASE USING ANN: A REVIEW

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Abstract-Artificial Intelligence is becoming popular in medical science. It works in medicines and biological research. Artificial neural network and Multilayer perceptron are methods of Artificial Intelligence. It is widely used in the medical field. It is applicable in Diagnose, Medical image analysis, Patient monitoring, classification and Data processing etc. This paper presents an introduction of periodontal disease and survey on various techniques used by researchers for predicting the disease.

Index Terms- Periodontitis**,** Artificial Neural Networks, Multilayer Perceptron, Disease.

I INTRODUCTION

Periodontitis is inflammatory condition of periodontal membrane. It is bacterial driven chronic disease of soft tissues. These soft tissues support the dental root. Periodontal disease occurs when bacteria affect the gingiva and extend to the periodontal membrane. The disease continues propagate, if left untreated. In the end it can lead to tooth loss. In periodontitis there are some stages through which this disease is propagated and those stages are gingivitis, mild, moderate and severe periodontitis. Gingivitis is the earliest stage of gum disease, in this stage gums are red, swollen and bleed easily. In next stage gums begin to separate from teeth and forming pocket which fill with plaque .In moderate, deeper pockets form and then tissues are lost. In last stage teeth may lose because large amount of tissue have been lost. There is range which shows the affected people i.e. Severe periodontitis affects 8.5% population where moderate 30% and mild in 9% of adults. There are some risk factor which plays a important role i.e. bacterial biofilm, genetic variation, life style and systemic factor. Periodontitis can be classifying by Aggressive periodontitis and chronic periodontitis.

This paper is organized into various sections that are follows: In section II Include the introduction of artificial neural networks. Section III explains the multilayer perceptron. Section IV Shows the research work of authors. Section V concludes the work on the behalf of research and presents the future scope.

II. ARTIFICIAL NEURAL NETWORKS

Artificial neural network (ANN) is simulation of biological nervous system like computer has its own brain. Artificial neural networks have number of nodes which is known as neurons. These neurons have connection associated with weights. Neural Networks used to solve problems when they are trained with weights. Those problems which does not have clear relationships in input and output variables. Neural network is effective approach for these kinds of problems. In the architecture of neural network there are three layers i.e. input, hidden and output respectively as shown in Fig.1. These layers has its own role like input layer provide the interaction with environment, hidden layer used for computation and last layer gives the output. Artificial neural network is mostly used in medical field to diagnose the various problems and disease.

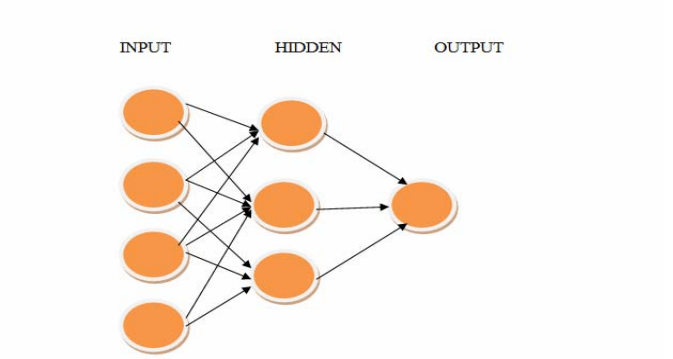

Fig.1. ARTIFICAL NEURAL NETWORK

III.MULTILAYERPERCEPTRON

There are many types of neural networks in Artificial intelligence. Multilayer perceptron is one of them which is most popular. It has many layers which is useful in fast computation. It has number of neurons linked together. Due to number of hidden layers it works effectively. Activation faction used for the computation in the hidden layer. It has bias neurons which have constant value as shown in Fig.2. These neurons are helpful for network to learn the patterns. Biases are independent from other neurons. Complex problems can easily solve with the help of

MLP. It is built to classify the patients which are affected and unaffected with disease. With this classifier optimization, classification, decision making can be done. It has capability to learn non liner model and real-time models. It is useful in mapping and learning. It is easy to implement. It has fault tolerance and generalization.

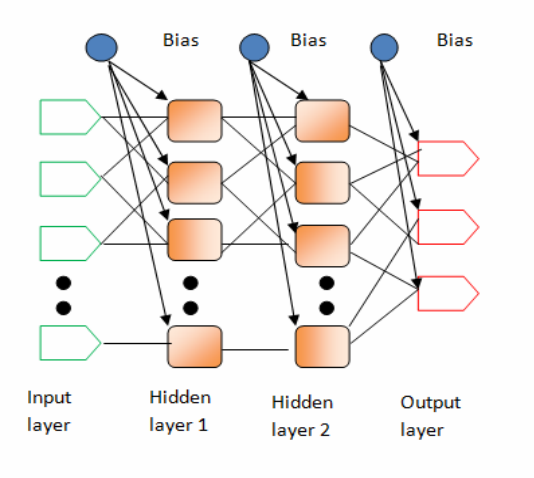

Fig.2. MULTILAYERPERCEPTRON

IV. LITERATURE SURVEY

Armitage, Gary C. (1999) In this paper new classification and conditions are present. This is different from the classification system which is developed at 1989 World Workshop in Clinical Periodontics. In this analysis of rationale is given for each modification

Papantonopoulos, George H. (2004) This paper shows that smoking is the risk factor of periodontal disease. In this clinically and radiographically comparison is done. Smoker and non-smokers patient had been treated for advance periodontal disease. They received maintenance therapy for minimum 5 years. There is no statistically difference between smoker and non smoker after 5 years. That difference showed in probing depth and bone loss measurement in radiography. In this, Analysis is done with the help of logistic regression.

Van Der Velden, Ubele. (2005) This paper deals with the purpose and the problem of periodontal disease classification. Classification means distribution into different groups. In this, periodontal condition is characterized by three symptoms i.e. loss of connective tissue, loss of alveolar bone, inflamed pockets. Various forms of disease is classify with nominalistic concept. This concept is simple to apply.

Page, Roy C., and Paul I. Eke (2007) This paper presents the case study. In this survey is done on the behalf of measuresing probing depth (PD), clinical attachment level (CAL), radiography and alveolar bone loss, gingival inflammation measured as bleeding on probing, or a combination of these measures. Other risk factors are also consider like age which can affect the PD and CAL. case definitions for periodontitis are based on measurements, and small changes in the values of result can do large changes in disease prevalence.

Youssif, Aliaa AA, Abeer Saad Gawish, and Mohammed Elsaid Moussa (2012) In this paper, for classification of periodontal disease an automated system have been developed. Feature extraction has been done with the help of H&E stained images. In the system image processing techniques has been used which is color deconvolution, morphological operations, and transforms for epithelium & connective tissue segmentation, nuclear segmentation and extraction of the features of nucleus, dilated blood vessels & collagen fibers[7]. Classification is done with the help of feed forward Back propagation artificial neural network. Results are more accurate with the mixed feature classification.

Eke PI, Dye BA et al (2012) This paper presented the prevalence of periodontitis in adults of U.S. Data collection is done from National Health & Nutrition Examination Survey.The severity of mild, moderate, and severe periodontitis was 8.7%, 30.0%, and 8.5%, respectively. Periodontitic ranged from 24.4% in adults 30 to 34 yrs to 70.1% in adults aged 65 yrs and older.

Aimetti, Mario, et al (2012) This paper deals with metabonomic analysis of saliva that shows the generalised chronic periodontitis. Metabonomic profiling of saliva samples provide a signature of the disease. Nuclear Magnetic Resonance (NMR) used for analysing the saliva samples. In this clustering and Support vector machine (SVM) used. Accuracy of Metabolic Profile is 84.1% of GCP patients. Metabonomic analysis is valid approach for identification of PD.

Kebschull, M., et al. (2013) In this molecular profiling is done to differentiate the CP and AgP. They use supervised classification with machine-learning algorithms and internal validation .They use Gene expression profiles. Small differences between gene expression and in highly variable classifier performance give the limited dissimilarities between AgP and CP.

Papantonopoulos G, Takahashi K et al. (2013) In this, author used the Cellular automata to understand the non linear dynamics of periodontal disease. Biological systems can be model by Cellular automata (CA) which is time and space discrete dynamical systems. In this simulation is done by CA experiments Which shows that how the disease is propagated. There are three groups of CA rules i.e. spreading, remaining constant or receding the disease. Periodontitis is a nonlinear dynamical process which is recommended by this study through mathematical model.

Papantonopoulos G, Takahashi K et al. (2014) This paper presents the artificial neural network (ANN) and immunologic parameters which is trained to diagnose the Aggressive Periodontitis. In this ANN used to classify Agp and CP patients and it trained by cross entropy (CE) values. To estimate the probability of derived dataset kernel density estimation (KDE) proposed.Accuracy of ANN 90%–98% to classify the AgP or CP patients.

V. CONCLUSIONS

In this we present that ANN is propose to predict the periodontal disease. It concludes from literature review Artificial neural network and Multilayer perceptron are best to predict the disease. It works efficiently in medical field and others. Because it has N number of hidden layers. MLP is superior in terms of classification. In MLP error rate is less so that it is efficient. Many researchers show that Artificial Intelligence techniques are more reliable than others. Periodontitis patient can easily classify by using ANN. Future scope is to propose optimize periodontal

system with different risk factors by using effective AI techniques and large array of parameters can turn a treatment of periodontitis from concept to reality by employing it.

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