

Chapter 31

A Hybrid System Based on FMM and MLP to Diagnose Heart Disease

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ABSTRACT

In the medical field diagnosis of a disease at an early stage is very important. Nowadays soft computing techniques such as fuzzy logic, artificial neural network and Neuro- fuzzy networks are widely used for the diagnosis of various diseases at different levels. In this chapter, a hybrid neural network is designed to classify the heart disease data set the hybrid neural network consist of two types of neural network multilayer perceptron (MLP) and fuzzy min max (FMM) neural network arranged in a hierarchical manner. The hybrid system is designed for the dataset which contain the combination of continuous and non continuous attribute values. In the system the attributes with continuous values are classified using the FMM neural networks and attributes with non-continuous value are classified by using the MLP neural network and to synthesize the result the output of both the network is fed into the second MLP neural network to generate the final result.

INTRODUCTION

The task of classification is an emerging trend in research. Soft computing techniques such as artificial neural networks, fuzzy logic and neuro-fuzzy networks are widely used for the classification purpose. Among these technologies, artificial neural networks have emerged as well – known solution for tackling pattern recognition and classification task (Devijver & Kittler, 1982; Duda & Hart, 1973; Fukunaga, 1972). Indeed, artificial neural networks are used for classification in many different fields, e.g. stock market prediction, medical prognosis and diagnosis, industrial fault detection and classification (Quteishat, 2007). In the medical field, artificial neural networks (ANNs) are deployed as diagnostic decision sup-

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port systems that help physicians diagnose diseases in the presence of uncertainty and imprecision. The system developed using artificial neural networks can be useful in assisting the physician arrive at an informed decision quickly, e.g. by learning from past cases with similar features in a large database of electronic patient records and inferring the diagnosis for the current patient with proper justifications (Seera & Lim, 2014).

The diseases such as Heart Diseases, Hepatitis, different types of Cancer, and Diabetics are major epidemics in India. The most popular among the above mentioned disease is Cardiovascular disease which is also called as heart disease, which occur due improper functioning of some of heart components. There are various types of heart diseases like coronary artery diseases, hypertension, and hyperlipidemia. The cardiovascular diseases (CVDs) or heart disease is the number one cause of death globally, more people die annually due to CVDs (cardio vascular diseases) than any other disease (WHO, guidelines). According to WHO (World Health Organization) report, CVDs (cardio vascular diseases) has become a modern epidemic. So, there is a need to detect or diagnose CVDs (cardio vascular diseases) at an early stage. In general, whenever a person feels some sickness he/she directly go the physician. A physician initially asks the basic symptoms, the person feeling and draw a conclusion that by which diseases the person is suffering from. Sometimes the disease is very complex and a physician can't draw a conclusion just by looking at the patient's symptoms, in such cases the physician ask the patient for some medical test like blood test, LFT (liver function test), KFT (Kidney function test), CT-SCAN, ECG (Electrocardiogram), PET (Proton emission test for cancer detection) etc.. Similarly, there are a number of medical tools used to predict CVDs, such as electrocardiography (ECG), magnetic resonance angiography (MRA) etc., but using these measurements in home health care is inconvenient due to expensive cost and invasive measurement (DONG et al., 2010). The physician looks at the results of these medical test reports and then draw a conclusion. But sometime the patient doesn't satisfy with the physician's consensus. The patient consults some other doctor/physician to confirm the disease. This procedure takes a longer time than usual and sometimes it will be too late to diagnose a disease. To reduce the diagnosis time and improve the diagnostic precision it has become more of a demanding issue to develop reliable and powerful medical decision support system to support the yet and still increasingly complicated diagnosis decision process (Yan et. al., 2006).

There are many other factors which motivated us to carry out the research work in the area of diagnosis of diseases using soft computing techniques such as artificial neural network (NN), genetic algorithms (GAs), fuzzy logic (FL), and evolutionary computation. Soft computing combines these mechanisms as FL and NN (FL-NN), NN and GA (NN-GA) and FL and GA (FL-GA). In our study, we have used NN along with the hybrid combination of FL (fuzzy logic) and NN (neural network) in parallel. From past few years, the phenomenal growth can be seen in bio-informatics and medical informatics by using computational/evolutionary techniques for interpretation and analysis of biological and medical data (Yardimci, 2009). These soft computing techniques can be used in a number of ways in the field of medical and biological data like they can be used for diagnosis of diseases, regime selection, prediction of failure and success of a particular treatment of a disease, robotic assisted surgeries and drug prediction on the basis of symptoms or the data available. We have chosen the diagnostic science in which the clinical parameter derived from laboratory test and obtained by examining the patient are used to predict that whether the person is suffering from any kind of abnormality or the person is healthy. In developing countries where medical information is not so much flourished, as the medical experts are very less in comparison to the patients and medical facilities are hardly available to the remote areas these automated system provides the improved health care services. These systems are reliable, cost

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