Classification and Categorization of Blood Infection Using Fuzzy Inference System

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Abstract:- From last few decades the human body infections and diseases are growing in exponential manner. As per the medical report, in every three months a new infection or viral comes in existence with some new explode to effect the human race. To test whether the infection is in body or not, Blood tests are the common methods. Most of the diseases are beyond the doctor's study or some recently spread virus infected the blood or human body. In such cases doctors use to give the treatment of other disease having same symptoms or same blood test cases. In this paper we are trying to make such a system which will spread awareness among doctors about the infections. The proposed system will work on the basis of fuzzy logic and neural network with the help of inference engine and its rules. The simulation will be done using Matlab. The proposed approach of using fuzzy logic and inferences with neural networks training in blood samples on real test cases of blood report is a novel idea.

Index Terms—About four key words or phrases in alphabetical order, separated by commas.

I. INTRODUCTION

As per medical report and statistics we have seen new viruses and infections come in existence very frequently. To check or to identify that infection now a day's bold test in the only common method. But the question is?

Is it always gives correct result or correct prediction by doctor? It has been observed that some diseases are beyond the doctor's control or some are recently spread viruses which infect the human body severely. In some cases doctor use to give the treatment of the disease having similar symptoms or the results of similar blood test cases. There are thousands of blood infections or viruses that occur directly and makes the blood contaminated. As the complete blood count (CBC) contains many components. The CBC test examines cellular elements in the blood, including red blood cells, various white blood cells, and platelets. Some components of CBC are WBC (white blood cell) leukocyte count, WBC differential count, RBC (red blood cell) erythrocyte count, Hematocrit, hemoglobin, Mean corpuscular volume, Mean corpuscular hemoglobin, Mean corpuscular hemoglobin concentration, Red cell distribution width, Platelet count, Mean platelet volume. Based on blood reports antidote of a particular disease get deployed. Need of an hour is the spread awareness among the doctors with respect to the new and ensuing infections, and to deal the situations in remote areas having such problems.

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II. LITERATURE SURVEY

As this is a novel approach but some researchers are working on such type of problems and some have done on other problems like detecting immune deficiency virus in blood. The author[1] introduced integrated micro fluidic system using using Rolling circle amplification (RCA) to detect DNA fragment of HIV-I automatically. Using that method, HIV could be detected automatically to reduce the risk of contamination without human intervention. For RNA extraction, a specially designed primer coated hook on the magnetic beads and a padlock probe will help specific in extraction of RNA with higher accuracy. The author had just ended with most promising tool for purification and detection of HIV at patients. One of the authors[2] had worked for point of care using interferometric reflectance imaging sensor. In that paper, author had presented a Single Particle Interferometric Reflectance Imaging Sensor(SP-IRIS) for sensitive and specific detection platform and serum in whole blood. SP-IRIS platform is capable of multiplexed pathogen detection. The method is capable of detecting single particle to bind events on interferometric surface. The process is done with analysis of data, automated data acquisition and easy to use software. Using micro fluidic cartridge with automated instrument will allow untrained user to run a sample to detect viral in point of care setting.

As we have observed, number of methods, approaches and techniques are there to find abnormal blood cell behavior. Based on that only, we used to point that it is a virus/infection in blood.

A whole survey is divided into two parts: first, to extract the behavior and structure of blood cells, secondly to recognize the abnormal behavior and classify the infection or virus. Wang Shitong had proposed a method over Fuzzy cellular neural network to recognize the white blood cells in our body. In 2007[3], IFCNN model was proposed. The model was designed to extract the boundary of white blood cells with the fuzzy status to get improved results over the conventional NN. Basically,, there are four common methods for recognizing the WBC: first is the acquisition of blood smear using microscope. Second, using segmentation method, single cell has been segmented. After fetching a single cell, third step is to extract the features i.e. shape, texture, colour to analyze the cell. Finally, the cell is to be added to an appropriate class i.e. WBC or RBC. Its not an easy task to extract a single cell through its boundary. Number of Image operations is required for this purpose. Morphological image processing plays an important role in extracting a cell. In that paper , author only discussed how to find that particular cell is WBC. It was an

automatic WBC detection system using IFCNN methodology.

In addition to IFCNN, Wang Shitong wrote another paper with AFCNN approach, advanced fuzzy cellular Neural Network [4], for CT liver images. The work is almost same. First of all, the boundary has been extracted. In addition, He has also put some light on CT, MR, US imaging and angiography methods for liver and its images. Problem of Liver boundary uneven pictures or overlapping has been resolved using AFCNN with multiple iterations. Author demonstrated the model results after 50 and 200 iterations on 5 different images. The rate of change in the result is exponentially increased. Dilation and erosion morphological operations are used to fetch the desired output. Above methods are the modified variants of FCNN for refined boundary results of blood cells and liver.

Second part of survey includes the identification of abnormal blood cell behavior or blood virus.

It has been studied that number of diseases passes over generations. Genetic relatedness is also played important role in spreading out the blood viruses. On a survey 2008-2013[5], David et al. discussed that HIV C virus is asymptomatic in nature. More than 70% infected persons came to know in 5 years or even decades. So, it's a good idea to stop its signatures in upcoming generations via genetic processing. In the paper, they had also focused on the high probability areas which or prone to HIV C blood viruses. Similarly, David had taken example of HIV B Virus likewise HCV.

Now numbers of approaches, algorithms are there to detect healthy and infected blood cells. We are able to find the infections or viruses in patient's blood. Next task is how to check the level of infections? In which rate it is increasing in blood? How to give the antidote to cure it or prevent it in blood? D. Elsheakh et al. [6] had given a solution of above questions. They tried to make a sensor which sensed the rate of increase of virus in blood. Basically the sensor would measure the biological impedance and reflection coefficient of microwaves of sensor which they would embed in blood. The sensor is named as "microimmuno sensor". The sensor supports the Bluetooth and other networking band of 10 Ghz whose data would be received by an appropriate antenna from 10 Mhz to 20 GHz frequency range. In experimental results Elsheakh and his team worked on rota virus and its removal in blood. The sensor, microimmuno sensor, is taking data from blood and corresponding to the values releasing the chemical in blood serum to stop the impact of rota virus.

After acquiring the data from various researches it can be easy to think on higher side. We can make such sensors or devices which carry the medicine and also test the blood. Surely this will improve the existing scenario of treatment and testing of blood and blood infections and viruses.

III. NEED OF SYSTEM

If we will make such a system which rings an alarming bell across the countries to notify about new infections and blood viruses, this will a boom in a field of medical science. The proposed idea is to make a system which classifies and categories the blood infections and based on the blood samples it will detect the particular infection or virus. In addition, System will be able to give the suggestions and updates on the newly introduced or added infections and viruses using its intelligence and learning mechanism.

Whole system will work in following manner.

1. First step is to take the samples of blood tests and fetch out the necessary parameters which reflects the infections in blood.
2. Secondly, a classification can be done based on the immunology by mycoplasma pneumonia antibody, and other haematology parameters like haemoglobin, white cell count, polymorphs, lymphocytes, monocytes, eosinophils, erythrocyte(RBC) etc.
3. These parameters help in finding out the infection percentage and finding the name of infection due to which blood gets contaminated.
4. Next step is to make the inference rules which will take decisions in finding out both. These inference rules will be decided by the expertise of the domain.
5. The beauty of the proposed system will be it will spread the updates around the world in patches of software or databases.
6. After these steps proposed system will tell the doctor or a person about the disease or infectious virus.
7. Last and major module of the proposed system is to train the system to explore more.

IV. KEY AREAS

1. Region wise statistics of infections and government or medical bodies can improve it further.
2. Helpful in remote areas.
3. IMA (Indian Medical Association)

V. MODULES

1. The word Collection of data set from net or any organization and research laboratory.
2. Implementation of fuzzy inference system. Inference system will further include its model (Mumdani), membership function, inference rules.
3. Then the training will be done by neural network. Most common model for that is HMM (hidden markov model).

VI. SCOPE

Once the system will get ready, it will work for the noble cause. Especially in the developing countries where the doctors need to improve but the technology is less in compare to developed nations, this proposed system will work like a domain expert and guide doctor in finding and recognizing an infection or disease. Numbers of researchers are working on this part, but, this proposed approach of using fuzzy logics and inferences with neural networks training in blood samples on real test cases of blood report is a novel idea. This proposed system will surely improves the way of treating with blood infections and other viruses.

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