Segmentation in Leukemia ALL Images Using Fuzzy Feature Based Optimized Classifier Method

Jeenia[1], Inderpreet kaur[2]
M. Tech (Scholar), Assistance Professor
Department of Computer Science Engineering
Rayat Bahra Group of Institutions, Patiala, Punjab (India)

Abstract - A cancer is a disease caused by an un-controlled division of disorder cells in a part of body. One of the types of cancer name is "Leukemia ". Leukemia is a type of cancer related in bones. It starts in the bone-marrow the smooth tissue classified most bones. The bone marrow is where blood smear cells are created. WBC (White Blood Cell) helps your body first infection and type of blood dis-order and its early disease plays a vital role in preventing the speedy progression of the cancer disease. The main goal of the research is how to use fuzzy feature concepts for arising a complete optimized classifier for disease of this dis-order in image of a patient's blood smear cells. Study of the smear blood microscopic image normally, consequences in early disease of leukemia with less costs. Additionally, diagnose control and screening is probable at later phases using blood smear cell images. The research work is to verify the features of WBCs and to detect the kind of Lymphoblast's leukemia. To detect the cancer in blood smear images or leukemia. A clustering algorithm implements to divide the cells in the two forms i.e. white cluster and red clusters. Extract the unique features which is identifying with the help of Feature Vector Algorithm. Extracted feature trained by the classifier technique i.e. used artificial intelligence approach. In testing phase verify the trained features through simulation model based. Evaluate the performance parameters like accuracy and WBC Pixel Size and compared with the existing parameters (Fuzzy).

Keywords – Leukemia Detection, Fuzzy, WBCs , RBCs and Feature Vector.

I. INTRODUCTION

Data mining likewise, known as data disclosure in database is method of separating possibly accommodating data from new information. A product mechanical assembly would examination is able to substantial amount of information and naturally explanation alluring examples without requiring human mediation. Leukemia is a type of blood cancer, initiated in bone marrow [1], where blood cells are accomplished. The bone marrow start making un-natural white blood cubical, referred to as leukaemia cells, but don't works like white blood cells. They develop remarkably faster than normal cells. At a point, Leukaemia cells outnumber the regular blood cells, which results in critical issues like bleeding, anaemia, infectivity, etc. These cells can spread to lymph nodes and other organs and causes bulge or pain. [2]

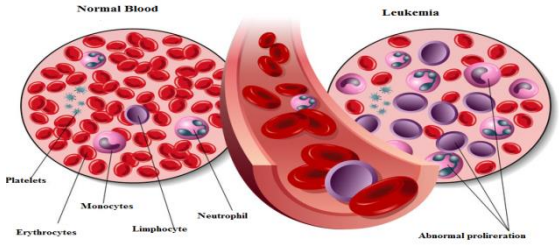

Fig: 1 Leukemia and Normal Blood

Leukaemia exists in various types. Specifically, leukaemia is gathered by how quickly it gets poorer and changes which type of white blood cell. The blood cells are experimented to discover several diseases. Variations in blood conditions exhibit the expansion of ailment in entity. Leukaemia is a cause of demise in case left untreated. Depending upon the quantity of data demonstrate that leukaemia is 5th reason of demise in men and 6th reason of death in women. Leukaemia establish in bone marrow. Each bone consists of a thin material inside itself [3].

The cells inside bone marrow begin changing and get contaminated to become stained cells or leukaemia. Leukaemia cells have unconventional possessions than normal cells and their growth is irregular and a presence time is more than normal cells and interrupts regular cells to perform[4]. After specific time normal cells pass away but leukaemia cells don't. The existing leukaemia cells lasts long period and new leukaemia cells keep producing. The charge at which leukaemia cells advance is distinctive as indicated by type of leukaemia. Undifferentiated organism advances into myeloid foundational microorganism or into lymphoid stem cell. Myeloid stem cell evolves into myeloid blast. Red blood cells (erythrocytes), white blood cells (leucocytes) & platelets are created from the myeloid blast. Lymphoid stem cell also evolves and leads to the lymphoid blast which will finally generate white blood cells.

II. RELATED WORK

We studied previous research work to understand the properties or features of leukemia blood smear dataset through dissimilar classification methods. Survey has been completed for extending the recent study to other performance parameters.

M. A. Khosrosereshki et al., 2017 [5] described the main objective of research to utilize the classification concept for deriving an appropriate classifier for disease of this dis-

order in microscopic picture of a patients exterior blood smears. Study of blood smear images normally consequences in-early disease of leukemia with fewer costs. Additionally, disease manager and considering are possible at later phases using blood smear images. A utilize of images for disease is few costly in-terms of the requirement and material required to identify the diagnosis in comparison with other techniques in the area of haematology. The primary purpose is to verify features of WBCs and to identify the kind of lymphoblast's using morphology approach for the disease of ALL (Acute Lymphoblastic Leukemia). A total set of 32 blood smear images are utilized in this system and decisions concerning sub-type of ALL are conducted based-on rule system proposed in the paper.

Ashwini Rejintal et al., 2016 [6] described the strategy is efficiently associated to several numbers of images, representative accurate consequences for modifying image standard. Characteristic image handling evaluations for illustration, Clustering, enhancement and arithmetic procedure and labelling are performed operating simulation MATLAB Tool. Operating a segment of the productive picture managing instruments they could verify and part of diagnosis cell. Image segmentation helps in defining the detail shape and size of the leukemia cancer cell and the field. Initialize they have used image improvement stages to enhance the quality in terms of contrast and normalise the pixel values in the image segmentation is used for segmentation. At the point they applied feature extraction after that they have connected it to classifier to get the desired consequences as whether the blood cell is cancer cell.

Basima C.T et al., 2016 [7] reviewed that Blood Cells are essential for doctor to diagnosis several disease like as, anaemia leukemia etc. The observation is same and classification of these blood cells scholarship for the estimation and identifying of prior number of sickness. By calculating WBC (White Blood Cells) permits the ALL, AML be cancer which infected on blood which could be deadly if it could be un-treated. So, an accurate, numbering and classification of BCs (Blood Cells) have a significant rule. Moreover the counts especially dissimilar counts and shape defined various valuable information to evaluate the leukemia. In recent techniques the morphological calculation of haemocytes was evaluated manually by experts and numbering of BCs (Blood Cells) is completed using a device called HAEMOCYTOMETER. In this approach have so various disadvantages like as dissimilar standard and slow-estimation, dependence on the skill operators.

Sonali Mishra, et al., 2016 [8] outlined the illness, its side effects, how hurtful it can be if not analyses at the correct time. The word explains the delicacy or absence of simplicity in body. This requires restorative treatment in request to overcome from the turmoil. Doctors over the world are attempting their best to see the explanations for the disorder and how to put a stop to the expanding rates of the infections or how it can be dealt with. Among all illnesses, Leukemia, a harmful neoplastic issue is an eye-getting, rising examination zone for specialists willing to work in restorative picture preparing. Likewise, they have given a brief depiction of the present advances that were utilized for the discovery of dangerous tissues exhibit in the white platelets[11,12].

III. RESEARCH WORK

In this section, the research works on Leukemia disease classification using artificial approach with BPNN algorithm.

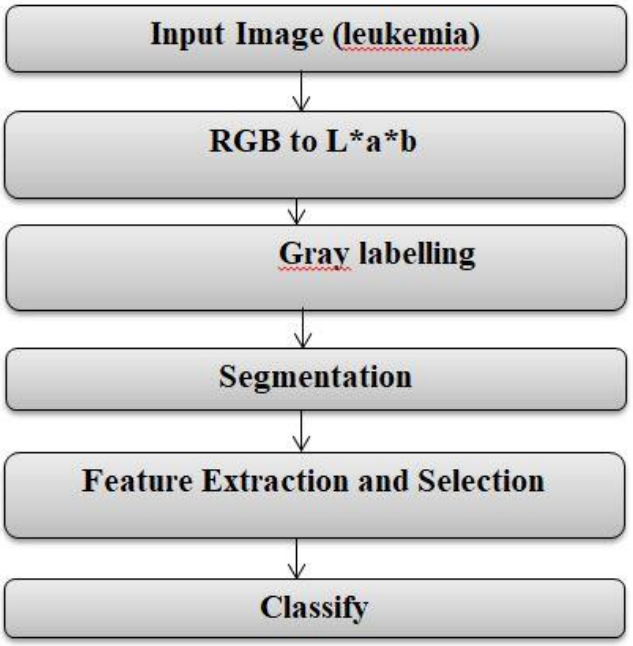

Fig: 2. Proposed Work

Below tables and figures represent comparison between different neural network approaches and features. All these different classifiers compared with the features connection and combination. They showed that Multi-layer Neural Network are more efficient than Gaussian and neural network Functions in leukemia diagnosis case. Therefore, it is decided to use BPNN classifier is used with neural network function in our study.

Step1: Input the collected dataset of serene with features.

Step2: Identify the region based on Clustering Method.

Step3: Reduce the features by feature selection using information improvement and correspondence.

Step4: Improve the feature by feature extraction.

Step5: Select the feature based on Genetic Approach.

Step6: Train the features with label to BPNN.

Step5: Analysis Means Square Error, False Acceptance Rate and False Rejection, accuracy.

Pseudo Code in FCMC algorithm -

Initialize

Fix cc,c<cc<nn;

Fix ∈, (e.g., ∈ = 0.001);

MixIter e.g. MaxIterat =100;[9]

Select any inner value norm metric e.g. ED is Euclidean Distance.

Solution m, 1<m<∞ , e.g., m=2;

Randomly initialize V0 = v1,v2,…..Vc cluster centres;

For Loop tt = 1 to MaxIters do

Update the member-ship matrix U,

Evaluate the new group centers Vt

Evaluate the new Objective Function Jtm.

If abs(jtm-jtm-1 < ∈ then

Break;

Else

Jtm-1 = jtm;[10]

End if

End for

End

IV. RESULT DISCUSSION

These all the steps of implementation are practically performed in MATLAB. The microscopic images should be in MATLAB folder.

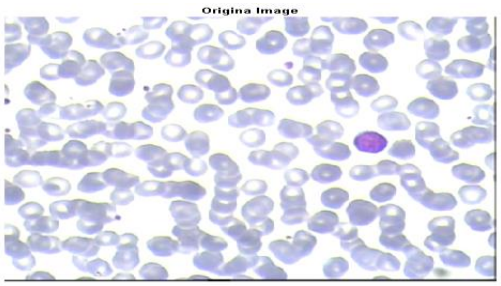

Fig: 3. Original Page

The above fig 3 shows the uploading of the microscopic main image in dataset and this is the actual microscopic blood sample of patient collected from nearby LIS images. Its actual colour is in purple form.

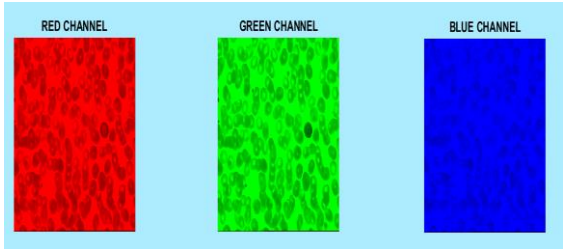

Fig: 4 Colour channel Extraction

The above fig 4 defined that the colour channels extraction. RGB shading space is extremely a method for speaking to pictures utilizing three esteems Red, Green, and Blue, that will trick us into supposing we are seeing something in reality. Pictures would thus be able to be put away as a 3 exhibits esteems, with each of the three esteems framing a solitary pixel, or purpose of shading, to be shown. Each of the three varieties of qualities is known as a channel, which is basically a dim scale picture speaking to the measure of light to make for only one of our shading sensors.

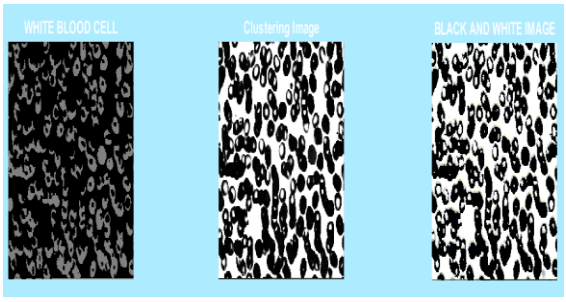

Fig: 5. Clustering /Segmentation Algorithm

Figure 5 defines the white blood cell in microscopic images. We can find the one white blood cell in auto counting. This figure shows that the index clustering image means clustering image only divide in two parts. We can extract the cluster form and Background Image also. It defines the solidity parameter means to clean the image convex area, roundness means clean the cell parts and auto count found the clustering image value is 1.

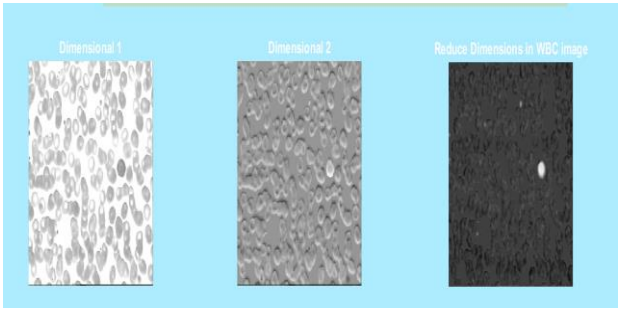

Fig 6. Feature Extraction and Dimensional Reduction

The Fig. 6 shows that the feature extraction image using Principle Component Analysis feature transform. To detect the unique properties and in the form of matrix i.e Eigen values and vectors in different positions.

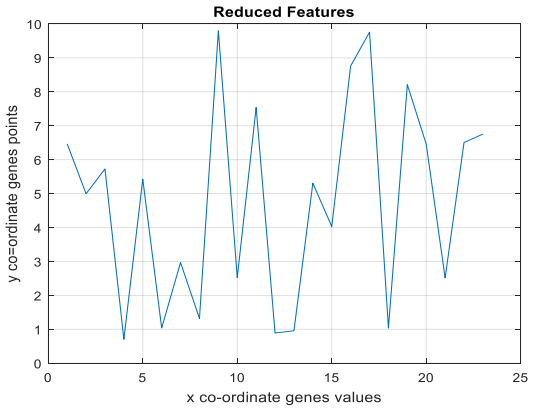

Fig 7. Feature Selection

The above fig 7 defined that the feature selection using Genetic algorithm. In Genetic algorithm is a universal algorithm. Select the features based in three operator's i.e, Selection, mutation and Crossover. The wellness work used to advance a divider following operator will be unique in relation to the one used to advance a timetabling operator, for instance.

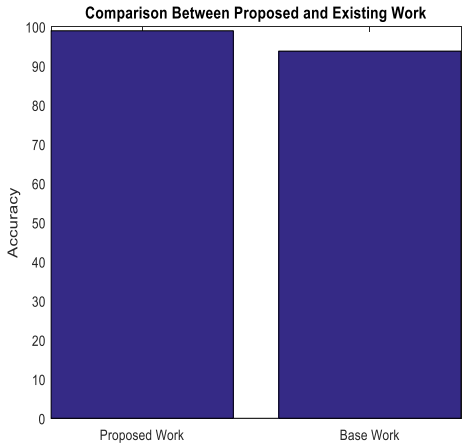

Fig: 8 Comparison between Proposed and Existing Work

Fig 8. Defined that the comparisons between proposed and existing work. In proposed work defined that the accuracy value is 98% and existing accuracy value is 93.7%.

Table 1. Comparison between Proposed and Existing Work

Accuracy in Proposed Work	Accuracy in Existing Work
98.9%	93.7%
98.8%	93%

Table 2. Proposed Parameters

Images	MSE	FAR	FRR	Accuracy
1	0.01483	0.010373	0.000108	98.8
2	0.01492	0.010563	0.000118	98.9

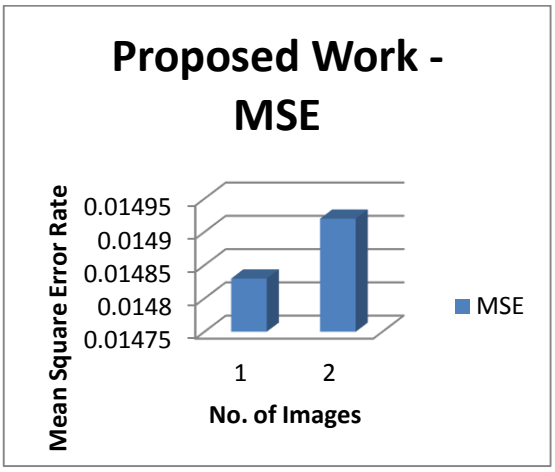

Fig: 9. Means Square Error in Proposed Work

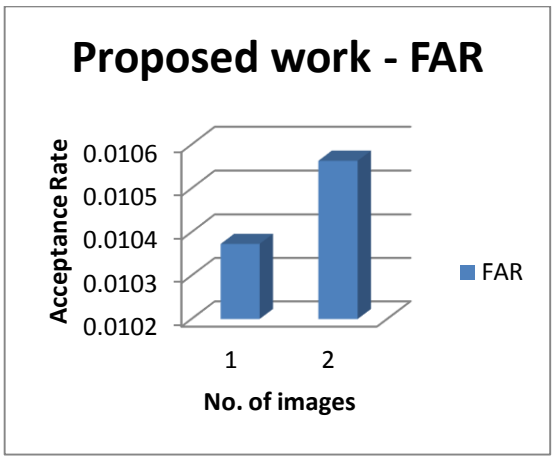

Fig: 10. False Acceptance Rate in Proposed Work

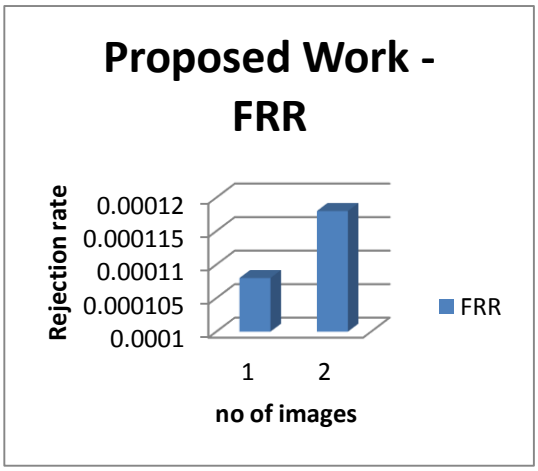

Fig: 11. False Acceptance Rate in Proposed Work

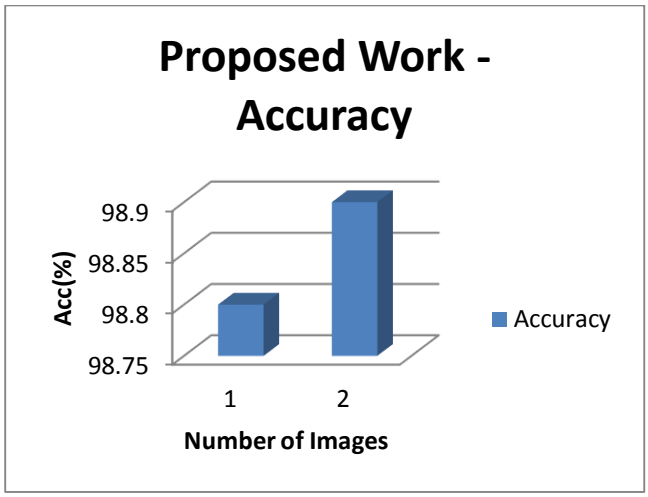

Fig: 11. Accuracy in Proposed Work

V. CONCLUSION AND FUTURE SCOPE

In this thesis, the classification accuracy of leukaemia segmented ALL dataset is calculated using the artificial Intelligence method Back Propagation Neural Network (BPNN) technique with Simulation model of medical image processing used as a classifier and also use feature Extraction , Feature selection method with information retrieve the data and unique feature extract based on Analysis of feature selection with both approaches and use result by PCA for data analysis and GA for feature selection method. To research an automated system which can detect the leukaemia from the microscopic image to improve the accuracy and reduce the time to detect than the manual approach .So many lives can be save by using the proposed approach of leukaemia detect. The feature extraction image using Principle Component Analysis feature transforms. To detect and selected feature in the unique properties and in the form of matrix i.e. Eigen values and vectors in different positions. After extraction we apply the problem solving algorithm using Genetic Algorithm. The main part of this work is to segment the white blood cell for leukaemia detect. The training module using Back propagation Neural Network for classification purpose. First, epochs means how many numbers of epochs to complete the training module, time consider and performance. In our experimental analysis on the parameter of accuracy, mean square error rate, false rejection rate and false acceptance rate, which better define the feature extraction and selection and union of features comes in identify the unique features approach output. If analysis the results 98% accuracy in FCM, PCA, GA and BPNN and 93.7% in existing approach (fuzzy method), it can conclude connection of feature reduces the information and increase error.The future scope, there are so many ways to make this system better in future. We can improve the segmentation scheme which can segment the overlapped cells also. There were found the use of optimization techniques in some systems. We can also use Firefly optimization technique to improve the auto count of the reduction. Doing so will increase the cost but accuracy will also be improved. We can use parallel algorithm for the execution so that the execution time can be decreased.

VI. REFERENCES

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