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A QUANTITATIVE ANALYSIS TECHNIQUE FOR EARLY DETECTION OF RESPIRATORY VIRUS IN LUNG REGION USING PNN

Arun B Mathews[1] and Krishna Prasad K[2]

[1]Post-Doctoral Research Scholar, Srinivas University, Mangalore

[2]Associate Professor College of Computer Science and Information Science, Srinivas University, Mangalore, India

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ABSTRACT

Respiratory detection system (RDS) is one of the foremost driving causes of around the world passing and requires appropriate therapeutic treatment. As a result, the aim of this paper is to categories lung MRI channel images as undesirable or commonplace. Our most recent suggested Probabilistic neural network (PNN) appearance makes use of image mixture and PNN approaches. To begin with, multiple preprocessing operations have been used by using multi-focus image combination in order to improve the accuracy of MRI images. Energize, preprocessed images are energized into the recently proposed 13-layer PNN structure for RDS classification. Two experiments on two separate databases were used to assess the consistency of our PNN protocol. The MRI image dataset is divided into 20% research and 80% preparation sets in the first attempt, but 10-fold cross-validation of the image dataset is done in the second attempt. The classification exactness obtained by our methodology on dataset 1 in the first test is 98.33 percent, and in the second test, it is 98.77 percent, while in dataset 2, the exactness obtained in tests 1 and 2 is 92.22 percent and 93.33 percent, respectively.

KEYWORDS: Breathing Issue, Human respiratory System, Equalization, Fuzzy logic and PNN.

1. INTRODUCTION

Many researchers in medical domain are adapting modern techniques for prediction of RDS diseases. These techniques always support experts in identifying diseases and taking preventive measures and facilitate treatment planning. Study of RDS diagnosis from MRI of the lung using IP methods, is one of the most predominant and demanding field in the area of research. However, large numbers of

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patients are suffering from RDS without any age distinction. Identification or the prediction of RDS in early stage will save many human lives.

According to medical professionals and researchers from the medical domain, RDS is one of the most dangerous and life-threatening diseases of the human body. Later stage identification of RDS will result in the patient going into a state of comatose/coma, and at times lead to death. This motivates researchers to identify and predict RDS region in the suspected region with the early symptoms, and identify the type of RDS with the help of MRI lung images. IP and segmentation algorithms are identified, and the best method that predicts the accurate location of region in the lung with the help of MRI lung image is identified. RDS generally recognized with screening of sequential scan images, will be identified mainly by the symptoms of headache along with the other complication in most of times.

Medical image applications are improving day by day with the adoption of modern technology to improve predication, analysis and prevention of diseases. New and innovative technology provides an opportunity to experts to contribute and improve the identification of diseases due to economic and environmental changes. As a computer graduate, this motivates myself to do this research work and also to resolve some issues that could help the medical society to take preventive measures for various diseases. This work studies the identification of BB through image segmentation techniques and this is one of the most demandable medical areas. However, large numbers of people are suffering from various types of RDS without any age difference.

2. LITERATURE SURVEY

A few intrusive estimation procedures are proposed to gauge Breathing Rate (BR) such as electrical impedance tomography [6]. In any case, the conventional BR estimation strategies depend on uncommon electronic sensors, and skin-contact required by rebellious brings much bother and inconvenience to individuals [7,8]. In this case, computer vision analysts propose non-contact farther BR estimations from visual information to screen the Breathing Rate.

This algorithm discussed the different preprocessing algorithms, which re applied to extract the RDS affected region from MRI images. Smoothing and noise reduction filters are the essential filters that should be applied to MRI respiratory images. Perona and Malik's filtering technique is one of the best filters, which provided best results for the database taken in this study [5]. Choosing an appropriate filter for preprocessing technique, leads to better results in subsequent stages such as segmentation, classification and in the extraction steps of the images [10].

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This algorithm is compared with other existing algorithms based on their performances. FCM plays a major role here. This method consisted of two stage approach, one which filters the noisy image using non local Principal Component Analysis (PCA), and the second channel organize employments this sifted picture as a guided picture with non-local cruel filter. This method internally calculates the amount of total noise present in the image and also corrects the images with spatial Rican noise, based on the bias induced locally [9].

Both cases are potentially devastating and life threatening. PSO, FCM, Electro Magnetic Optimization (EMO) and LSM are the methods which successfully segmented suspicious RDS in digital MRI images [10]. Many researchers have carried their work based on swarm intelligence concepts, especially, in PSO. There are many challenging problems in segmenting MRI images. The work carried by these researchers involved the implementation of PSO and they developed some hybrid algorithms based on swarm intelligence concept in various fields, and these algorithms have several applications [11].

Using a fuzzy logic method, a novel technique for modelling human vision based on colours is presented. Because of the use of fuzzy logic schemes, the clusters are not restricted to linear or rectangular lines. The experimental results indicated that the Comprehensive Learning Particle Swarm Optimization (CLPSO) algorithm performed better than the FCM and K-Means algorithms and allowed for a wider range of real-life applications [12].

The proposed novel algorithm was formulated by modifying the objective function of the FCM algorithm and the voxel values are influenced by the immediate neighborhood voxel values. This methodology is mainly useful to segment MRI images, which is majorly corrupted by salt and pepper noises. The algorithm is tested for both synthetic and Data from MRI lung images were used to show the reliability and efficacy of the proposed procedure [13]. areas.

3. Histogram Equalization (HE)

The Histogram equalization is a method used to adjust the intensity values of the images which enhances the contrast. Then the histogram of output region is matched with another specified histogram. Histogram equalization is used to improve the contrast of the fundus image. This is carried out by modifying the histogram. Contrast enhancement technique is used to enhance the fundus image, the histogram simply plots the frequency occurrence of each gray level i.e., from 0 to 255.

The histogram equalization is

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$$r_k = \frac{n_k}{N} \quad (1)$$

where

n_k is the intensity level

Nis the total number of pixels in image

Let fundus image can be represented by 'm' and pixel intensities of integer may be ranging from 0 to L-1

$$\rho_n = \frac{\text{number of pixels with intensity n}}{\text{Total number of pixels}} \qquad n = 0,1, \ldots \ldots, L-1 \quad (2)$$

where L is the intensity values

ρ is normalized histogram

Thus, the fundus image is enhanced and it has a tendency to achieve its brigh Uniform intensity distribution is created due to the reassigning of intensity pixel value to the existing ones. Contrast enhancement is performed on the filtered image by the histogram equalization.

Step 1: Load the MRI respiratory system image from the MRI scanner in the DICOM format

Step 2: Using the available software convert it into standard image file format (.jpeg, .gif, .png, .bmp, etc.,)

Step 3: Store the image with the standard .jpeg extension

Step 4: Convert the image into a 3D matrix and read the image properties such as size, color and image type

Step 5: Apply HE to the MRI image using equation (3.1)

$$f(x,y) = HE \in S_{xy}\{g(s,t)\} \ldots.$$

Step 6: Store the resultant images with its execution time, memory size and pixel variation for further analysis.

4. Fuzzy logic algorithm (FLA)

A capable measurable strategy is central component investigation. This strategy can be utilized to recognize designs of tall measurements. FLA is utilized in design acknowledgment and confront compression. In design acknowledgment issues, the preparing pictures are put away in vital component

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frame, and after that the information is utilized to discover the closeness or divergence between an obscure dataset and the put away information. FLA is viably utilized in optic plate discovery.
In the proposed research, the localization phase includes the estimation of optic.

The Sequential procedure of FLA Algorithm as follows

Step 1: Procedure FLA (Image set X, cluster K)
$X = (X_i)_{i=1}^{N}$, and K Return U and R.
Step 2: nU0 is randomly initiated
Step 3: Repeat
Step 4: The values are put away between 0 and 1, which speaks to the membership information focuses for each and each cluster, whereas the difficult c-means employments as it were and 1 as the two values for the participation function

$$J^1(u,v) = \sum_{i=1}^{c}\sum_{j=1}^{n} u_{ij}^{m} \left\| X_j - V_i \right\|^2 .$$

Step 5: Implement the equation

$$J^1(u,v) = \sum_{i=1}^{c}\sum_{j=1}^{n} u_{ij}^{m} \left\| X_j - V_i \right\|^2 .$$

u u is the membership value of j X with respect to cluster i .

$$u_{ij} = \frac{1}{\sum_{k=1}^{c} \left(\left\| X_j - V_i \right\| / \left\| X_j - V_k \right\| \right)^{2/(m-1)}}$$

Step 6: End procedure

5. PNN classifier

The following are some of the most critical layers that were used in the preparation and testing of PNN The foremost aim of PNN algorithm for this input MRI images is to detect the BB affected region from the images based on its intensity values. It randomly choses the pixel values and iterates its value based on PNN algorithm's functions and definitions. PNN calculation is basically based on the objective work and enrollment work, which is spoken to by U framework. The values are put away between 0 and 1, which speaks to the participation information focuses for each and each

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cluster, whereas the difficult c-means employments as it were 0 and 1 as the two values for the enrollment work.

6. Result and Discussion

The experiments are carried out in the research work with MATLAB (R2019b) software. The hardware specification of the system used in this research work is with the Intel core2Duo processor 16GB RAM, running on Windows 10 operating system.

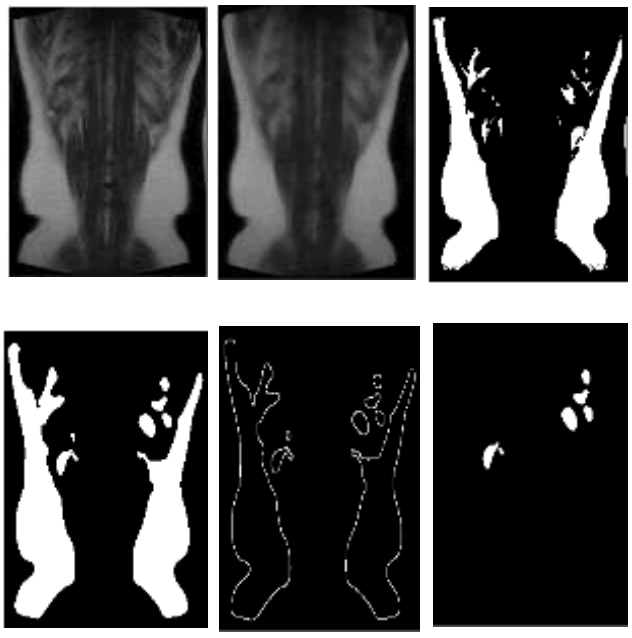

Fig :1 Experimental result of sample image 1 (i) affected system (ii)Histogram Equalization image (iii)Fuzzy C-Means threshed image (iv)Ostu image (v)Canny edge detected image (vi)Segmented region image

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Table 1: Performance measures of 80 % training and 20% testing of respiratory image 1.

Algori-thm	P	TPR	FPR	F-measure	Accuracy (%)
ANN	0.9004	0.8999	0.1	0.89	90
KNN	0.9751	0.974	0.023	0.97	95
SVM	0.9833	0.975	0.026	0.97	97.5
PNN	**0.9903**	**0.9823**	**0.01667**	**0.98**	**98.33**

The normal classification exactness gotten by ANN and KNN is 90% and 95% separately as shown in Table 1. In any case, PNN gives superior classification comes about as compared to others.

Table 2: Performance measures of 10-fold cross-validation of sample image 1.

Algorithm	P	TPR	FPR	F-measure	Accuracy (%)
ANN	0.95	0.95	0.04	0.95	95.34
KNN	0.98	0.985	0.02	0.98	98.52
SVM	0.97	0.975	0.014	0.978	97.99
PNN	**0.96**	**0.9823**	**0.012**	**0.987**	**98.64**

The normal classification exactness gotten by ANN and KCNN is 95.34% and 98.52% individually as shown in Table 2. In any case, PNN gives way better classification comes about as compared to others.

Table 3: Performance measures of 80 % training and 20% testing of respiratory image 2.

Algorithm	P	TPR	FPR	F-measure	Accuracy (%)
ANN	0.87	0.876	0.060	0.87	87.78
KNN	0.911	0.912	0.04	0.91	91.52
SVM	0.917	0.915	0.045	0.916	91.59
PNN	**0.923**	**0.924**	**0.039**	**0.923**	**92.64**

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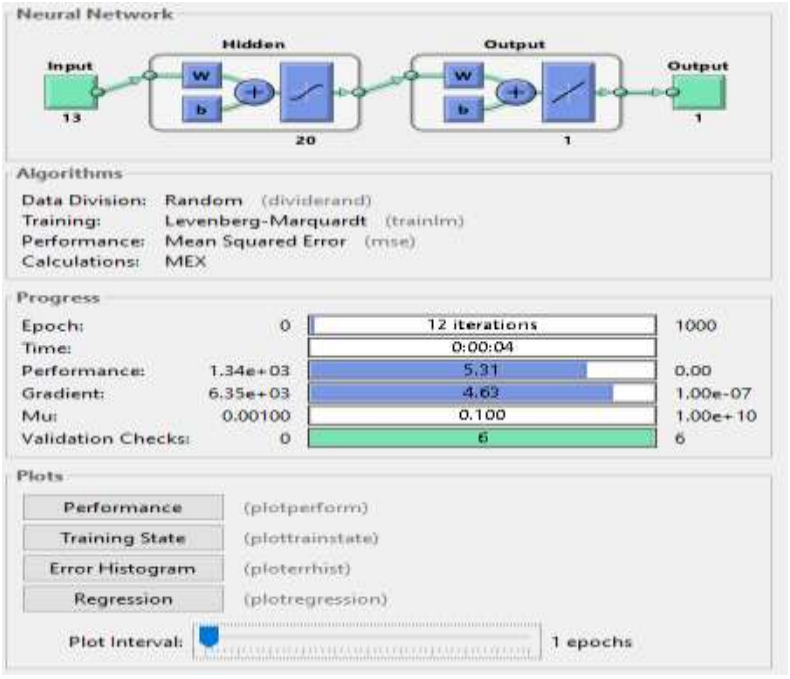

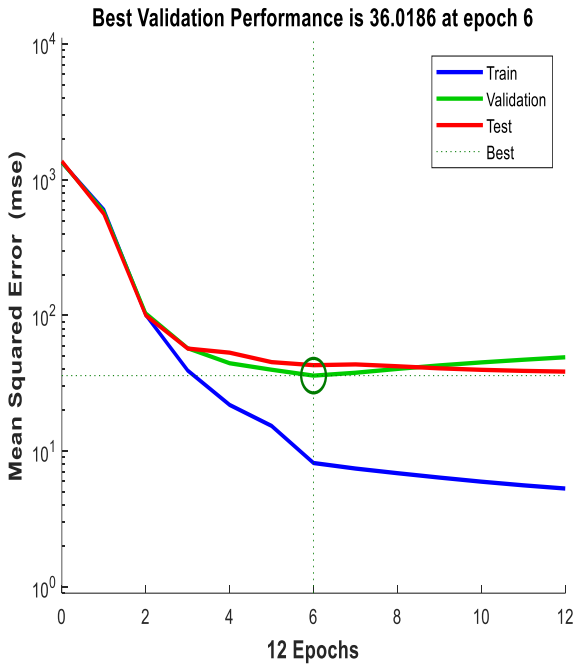

Fig 3: Performance Measures of validation

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This figure does not show any major issues with the preparing. The approval and test bends are exceptionally comparative.

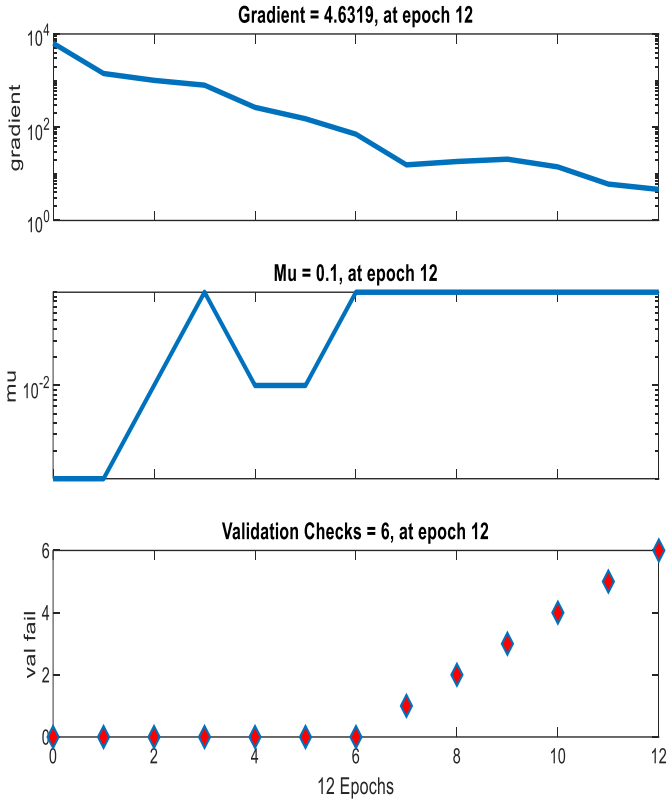

Fig 4: graph for Neural Network Training

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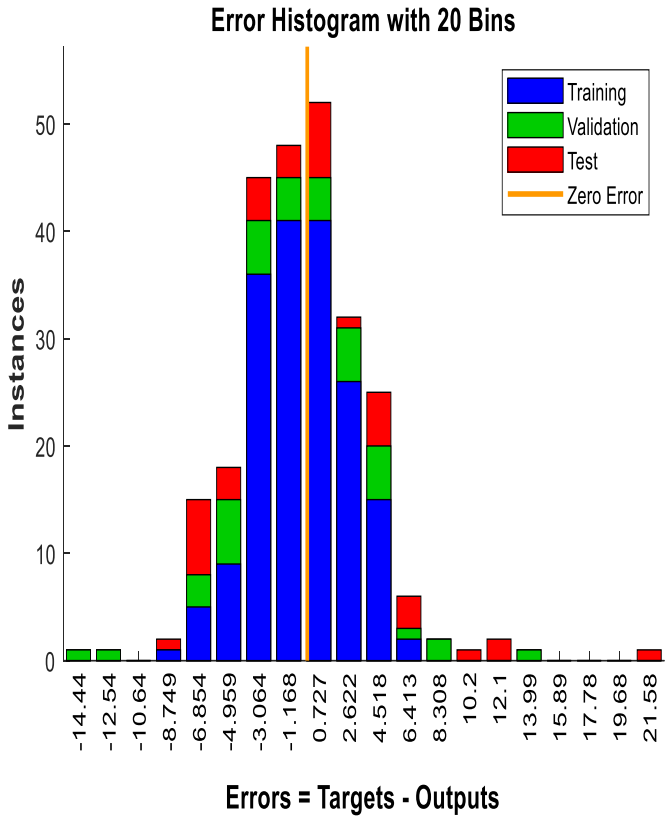

Fig 5: Histogram Error plot

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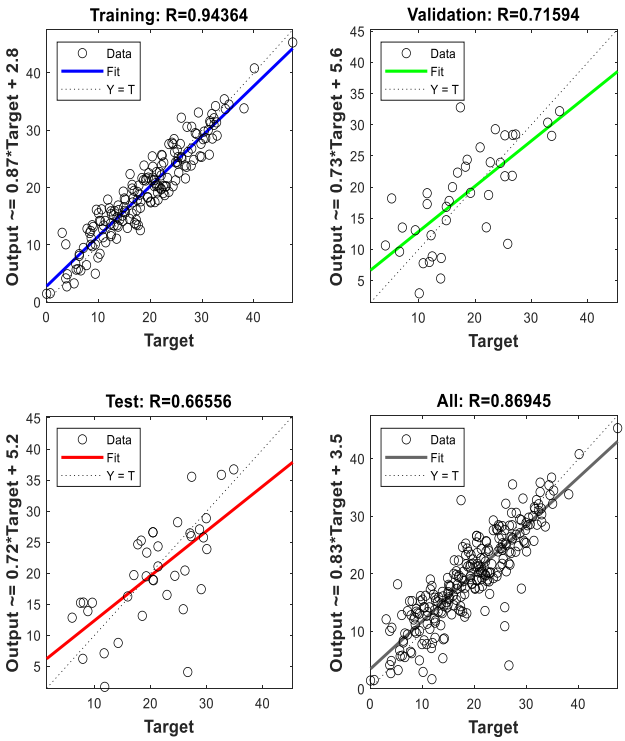

Figure 6: Regression plot for PNN classifier

Fig 7 shows the output of CNN classifiers which are the customary metrics morals for numerous features. It is possible to recognize from table, which feature amalgamations provides higher accuracy. Border error symbolizes the rate of faultily pancreatic images. This gives the more accuracy of 98.57%.

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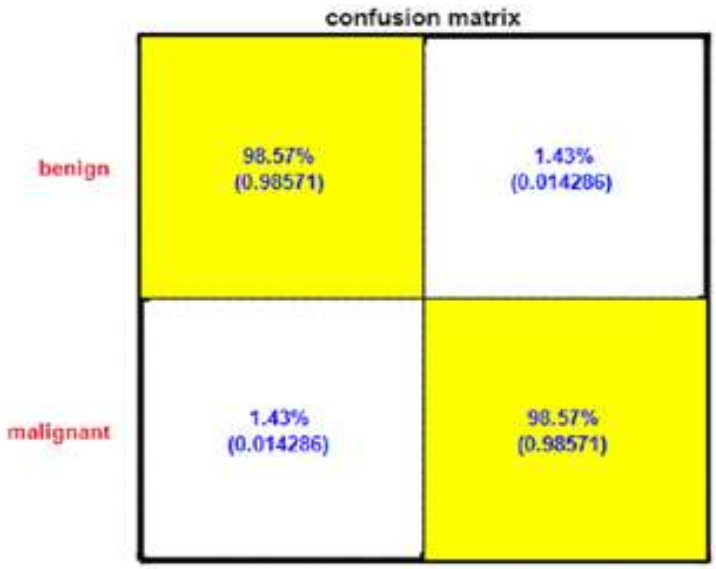

Fig. 7: Confusion matrix of CNN classifier

7. CONCLUSION

This paper presents an PNN classification technique utilizing picture combination and significant learning methodology for the detection of respiratory system. We have preprocessed the input picture utilizing quadtree based picture HE channels strategy. The HE procedure has been utilized to move forward the separate of RDS district. After that, a present-day PNN building has been proposed for the classification of Respiratory passing on into two (strong and undesirable pictures) and three categories (kind, unsafe and conventional) from MRI pictures. In this way, it can be particularly unfaltering for the masters inside the event that it is utilized in supportive hone.

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