# Computer System for Perception of Lung Cancer

**Rakhi Nautiyal, Anil Dahiya, Priyanka Dahiya**

***Abstract--Detection of cancer in its previous stages to increases survival rate of patient. CAD system is efficient because it take minimum time to detect weather the patient has cancer or not. It is very difficult for detection of lung cancer its earlier stage as it takes many tests. There are many of the CAD system which is designed for earlier detection of tumors. Many CAD systems have been designed in past for early detection of lung tumor. For segmentation purpose Thresholding is used and detection of area in which suspected tumor part growing algorithms is used. There are various factor is calculated using GLCM. Multilayer feed forward BPNN approaches for classify the feature set. Performance is calculated in form of mean square error (MSE) using BPNN. The CAD (computer aided diagnosis) model gives 90% true count. For implementation purpose MATLAB is used.***

***Keywords-CAD, Back Propagation Neural Network, Region of Interest, Computed tomography.***

## I. INTRODUCTION

Cancer begins in cells when body start grows out of control. Because of damage to DNA cell become cancerous. In normal case cell become damage or dies. In damaged dna cancerous cell does not improved and does not die. Rather then it continuously structure new cells in the body. When the tumor size increase then weakness the capability of lung to provide the good stream combination with oxygen[10]. Treatment for a tumor is possible by tests and it can be stopped propagates in further part of our body. Identification of cancer its previous stages known as tumor, it termed as cancer when it reaches to the uncontrollable stage. This paper presents a system for find the suspected reign for lung cancer using CT images.

## II. CAD SYSTEM

Many computer system have been designed in previously for classify the lung cancer. Computer-aided systems identify and mark suspicious regions on images to bring them to the attention of radiologists.There are various techniques of machine by which the system learn. the system design analyze the tumor area and predict the maligancy.

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In this CAD system mainly consists of four stages, preprocessing, extraction of region of interest, feature extraction of feature and classification.due to the less noise effect, CT image is used more than 20% including reference section.In the case of exclusion of references, it should be less than 5%.

## III. LITERATURE REVIEW

The Detection of lung cancer various contributions have been made in past few year. Shiying Hu et al[8] proposed a work using dip and Gabor filter within Gaussian rule for detection of lung cancer. Three types of Enhancement techniques is used that is Auto Enhancement, Gabor filter, fast Fourier transform. Gabor filter give best results. TAN Shanjun et al[2] proposed a CAD system by using an ANN. The result of all datasets of the test the accuracy was 95.5 % and 73.3%, respectively for accuracy of ANN and Detrimental analysis. ANITA CHAUDHARY et al[1] gives two classification algorithm that is FFNN and BPN. In this methodology is form of 0 and 1, if the patient has cancer then input is taken 1 otherwise 0.transfer function is sigmoid.

Jaspinder Kaur et al[3] proposed a CAD ANN system combine with tumor markers with some clinic methods. A total of 140 samples are obtained. Neural network with BP algorithms were performed. The model was developed by training and testing of the ANN was implemented by means of sigmoidal transfer function. The 5 tumor values were then used as ANN input data. Throughput of system analysis was 95.5 % and 73.3%, respectively. Analysis of multiple tumor markers based on ANN is a better choice than the traditional statically method for differentiating hepatic carcinoma from benign and normal

Mellisa Pratiwi et al[4] had done a survey on cancer prediction using neural network technologies for classification of cancer. Such as single layer NN, multi-layer NN and various kind of machine learning and statically approach as SVM, k nearest neighbor, decision tree[9]. In present time many researcher works on neural network techniques because it provide good classification rate. MLP give 97%, PNN give 96%, and SFNN give 93%, accuracy[6].

## IV. PROPOSED WORK

The system containing various stages. For the processing of system here I used CT images.

1**. Image Preprocessing**: CT image applied to system. In this to enhance the image quality we use various digital images processing approach.

a) Noise Removal: image is originaly contain the noise part to remove these median filter techniques is used.
b) Image Enhancement: for improvement the quality of images.
c) Morphological Operation: It perform opening and closing.
d) Image Segmentation: to divide the images into different object used segmentation.

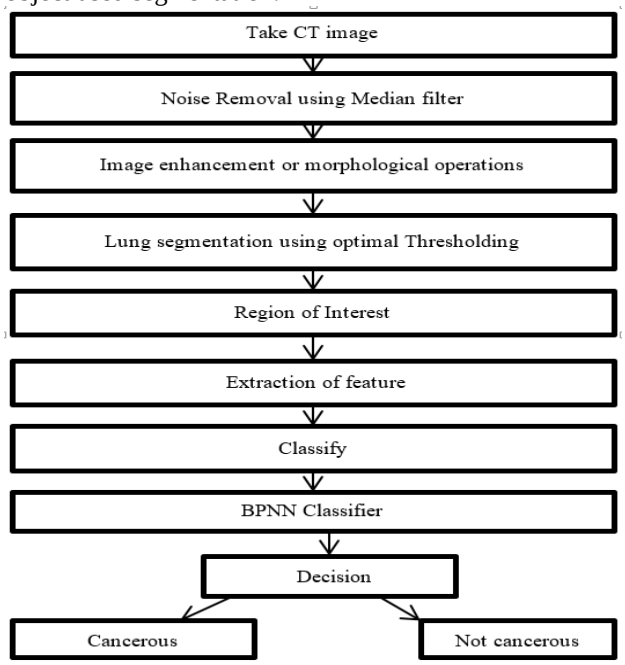


**Fig.1. Proposed system**

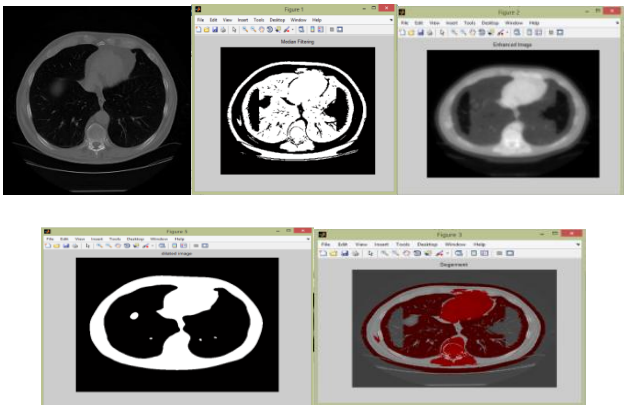

**Fig.2. Preprocessing steps For Image 1**

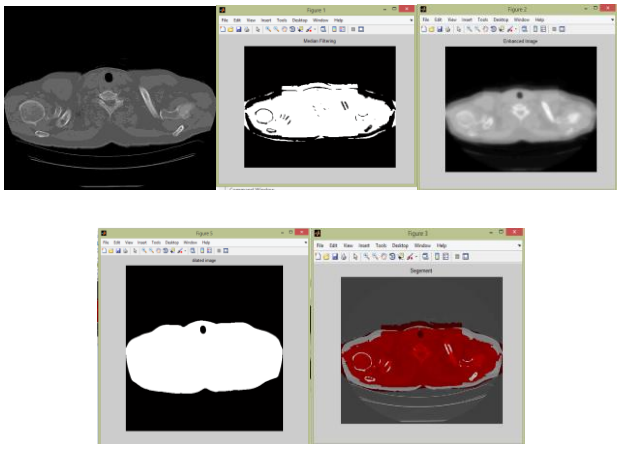

Fig.3. Preprocessing steps For Image 2

2. **Extraction of ROIS**: after the segmentation of images ROIs is detected. Region growing algorithm is used for this. In this approach seed point is consider[5]. It check further for neighbor pixel for next and continuously do. A pixel value is added into the area when difference between the next point and region is less than the threshold, else algorithm completed.

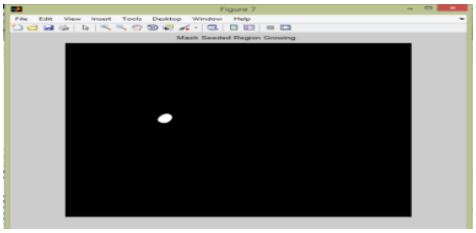

**Fig.4. Region of Intrest of image 1**

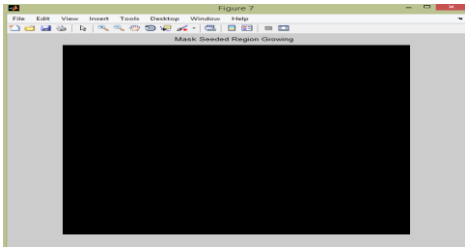

**Fig.5. Region of Intrest of image 2 (No Region Detected)**

3: **Feature extraction**: Features are selected from the ROIs of images. GLCM Matrix method is used for feature calculation. Some features are:

1) Energy: =

2) Entropy = -

3) Contrast = $\sum_i \sum_j g_{ij} log_2 g_{ij}$

4) Variance:

= where is mean of

5) Homogeneity:
Homogeneity (hom) =

6) Correlation:

Correlation=

Where the means and standard deviations of $g_x$ and $g_y$

7) Sum Average
Sum Average=

8) Sum Entropy:
=

9) Sum Variance:
=

10) Difference Variance: = variance of $g_{x-y}$

11) Difference Entropy:
=

12) Maximum Correlation Coefficient:

(MCC) = (second largest eigen value of Q )$^{0.5}$
Where Q(I,j) =

13) Information Measures of Correlation: Information measure of correlation 1 (IMC1)= Information measure of correlation 2 (IMC2)= entropies of $g_x$ and $g_y$ are HX and HY.

$$HXY1 == -\sum_i \sum_j g_{ij} log_2 \{g_x(i) g_y(j)\}$$

$$HXY2 == -\sum_i \sum_j g_x(i) g_y(j) log_2 \{g_x(i) g_y(j)\}$$

4. **Classification**: All the parameter of images are calculated from the ROI of the images. Then classify by the back propagation neural network and mean square error is calculated. The classification is based on performance matrices.

| **Accuracy** | TP+TN/TP+FP+TN+FP |
|---|---|
| Sensitivity | TP/TP+FN |
| Specificity | TN/TN+FP |
| Quality | TP/FN+FP+TP |
| correctness | TP/TP+FP |

Table.1.Performance Matrices Formulas

## V. EXPERIMENTAL RESULTS

The results shows that the classification Accuracy, Sensitivity, Specificity, Quality, Correctness is achieved upto83%, 76%, 90%, 72%, 92%.mimimize mean square error.

| TP=215 | FP=21 |
|---|---|
| FN=60 | TN=204 |

Table. 2. Binary classification confusion matrix for BPNN training

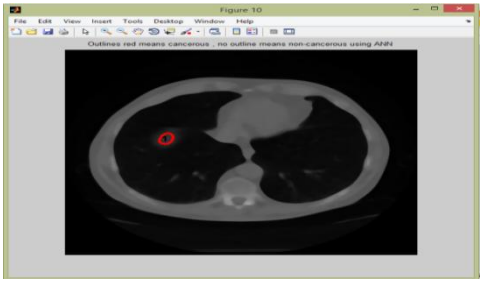


Fig.6. Result after classification lung region with red outline(cancerous)

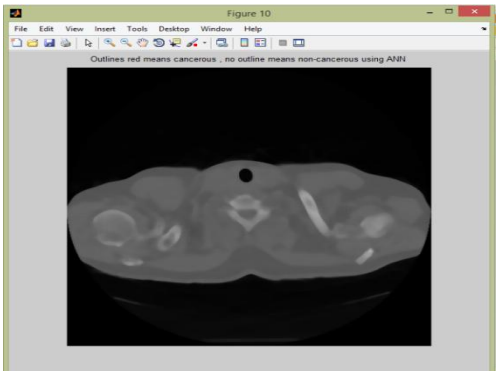


**Fig.7. Result after classification lung region without red outline(not cancerous)**

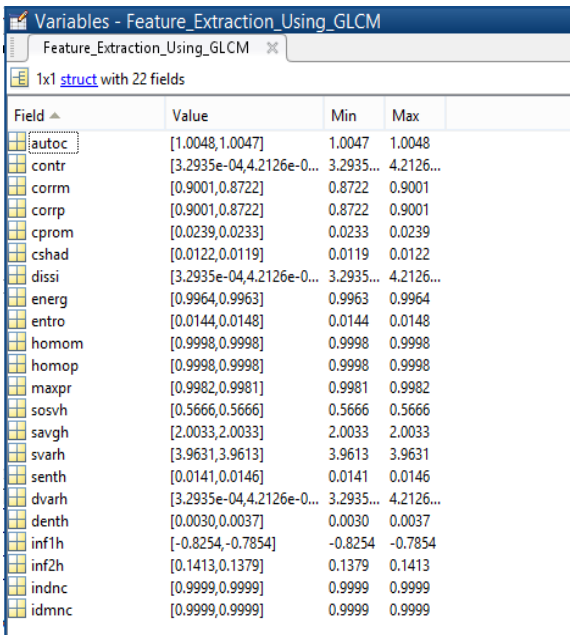


**Fig 8: Image 1 with Features Values**

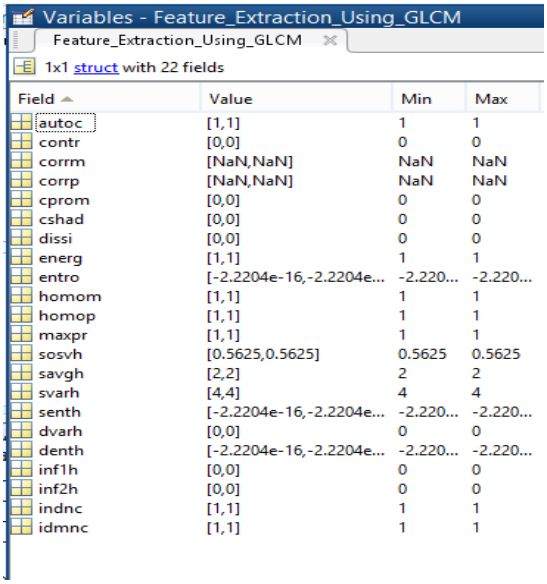


**Fig 9: Image 2 with Features Values**

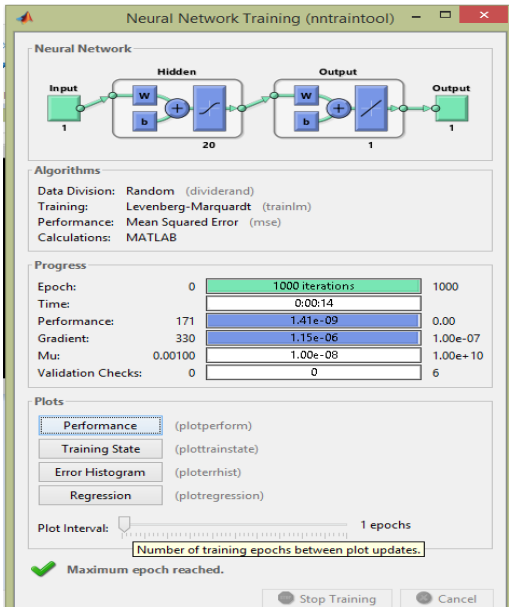


**Fig 10: classification using BPNN training (Image1)**

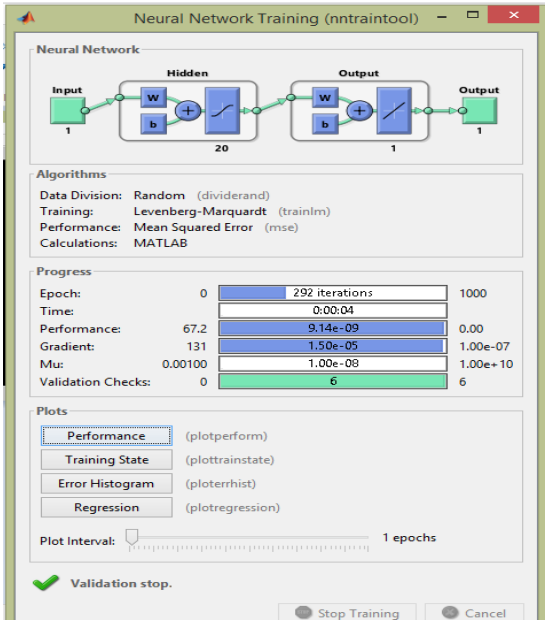


**Fig 11: classification using BPNN training (Image2)**

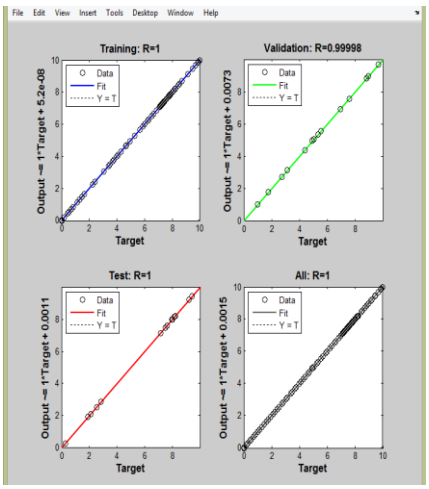


**Fig12: Image 1 with Training and Testing Back Propagation Neural Network**

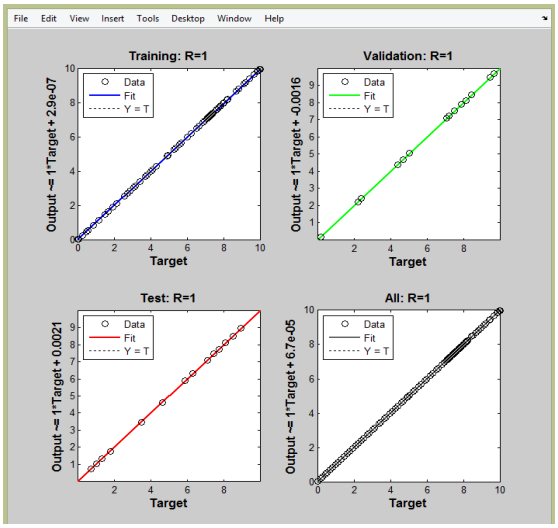


**Fig13: Image 2 with Training and Testing Back Propagation Neural Network**

| | |
|---|---|
| TP= 215 | FP= 21 |
| FN= 60 | TN= 204 |

**Fig 14: Binary classification confusion matrix for BPNN training**

## VI. CONCLUSION AND FUTURE WORK

In analysis of 70 patients which contains 500 image experiment is performed . The neural network classifier gives accurate diagnosis for classify the images. Lung cancer in the early stage is extremely necessary for fast recovery or to reduce the death rate. The dataset can be extended. Results can be compared using different algorithms for classification purpose. The next step will be find the stages in tumor.

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