International Journal of Advanced Trends in Computer Applications
www.ijatca.com

HYBRID MODEL USING COMBINATION OF NEURAL NETWORK AND SUPPORT VECTOR MACHINE FOR DETECTION OF LUNG CANCER ON DIACOM IMAGES

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Abstract: *Many people dying with any types of cancers colon cancer, Brest cancer, skin cancer and lung cancer. Every year 7.6 million people die with cancer. Existing techniques are very costly for detecting the lung cancer such as Chest Radiography (x-ray), computed Tomography (CT), Magnetic Resonance Imaging (MRI scan) and Sputum Cytology. So the requirement of techniques to detect the occurrence of cancer nodule in early stage is increasing. In The model consists of an input layer, a hidden layer and an output layer. The network is trained with one hidden layer and one output layer by giving twelve inputs. One of the most common forms of medical malpractices globally is an error in diagnosis. Inbuilt Neural Network toolbox and SVM has been executed using two steps training and testing phases. So I am proposed Hybrid technique combination of SVM and N/N. In order to provide better accuracy and comparison will be done on the basis of three parameter FRR,FAR, Accuracy apply on the DICOM images.*

Keywords: *SVM, Neural Network, Lung Cancer, SIFT, FAR, FRR, Accuracy*

I. INTRODUCTION

Lung cancer is the most huge reason for death merely 14% of men and women clinically determined to have lung cancer malignancy make it a few a long time as soon as the diagnosis. Signs or symptoms which will recommend lung cancer malignancy contain: clubbing on the fingernails (uncommon), Pain in make, torso, provide Dysphasia (difficulty swallowing). It is unpredictable to identify in its initial stages on the grounds that side effects rise just in the propelled stages bringing about the death rate to be the most elevated among every single other kind of growth [1, 2]. There are numerous strategies to analyze lung disease, for example, Chest Radiography (x-beam), Computed Tomography (CT), Magnetic Resonance Imaging (MRI output) and Sputum Cytology. As it were, the vast majority of these procedures are recognizing the lung malignancy in its propelled stages, where the persisting shot of survival is low. In this manner, there is an incredible requirement for another innovation to analyze the lung cancer in its initial stages.

The proposed methodology flowchart is given below.

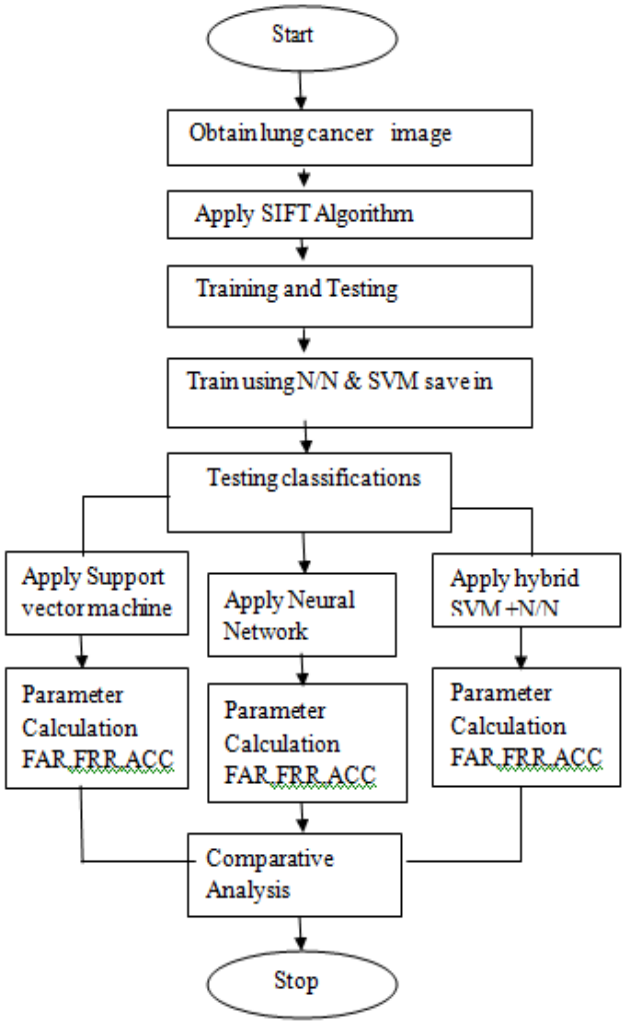

Figure 1: Proposed Methodology

1) Read from input image and localize face using image processing operations.
2) Extract features from diacom image using Scale Invariant Feature Transform.
3) Train and test using neural network, support vector machine, hybrid N/N+SVM.
4) Parameter calculation using FAR, FRR, Accuracy [10,11]
5) Calculate results.

The very first step is feature extraction that will be done by using SIFT algorithm, and then feature optimization by using neural network(N/N) & support vector machine(SVM).

II. PROPOSED MODEL STEPS

A. SIFT

Scale-invariant feature transform (or SIFT) is an algorithm in computer vision to detect and describe local features in images.

Algorithm Steps:

There are mainly four steps in SIFT algorithm:

- *Scale-space Extreme Detection*

To detect the large as well as small corners SIFT uses the Gaussian Pyramid. Once it has been found than images are searched for local extreme over scale and space [12].

- *Key point Localization*

Once getting interesting key points location, refinement should be done for more accurate results.

- *Orientation Assignment*

For achieving invariance to image rotation, an orientation is assigned to each key point. Depending on the scale and the gradient magnitude neighborhood is taken around the key point location and direction is calculated in that region.

- *Key point Descriptor*

Now key point descriptor is created. A 16x16 neighborhood around the key point is taken which is divided into 16 sub-blocks of 4x4 sizes 8 bin orientation histogram is generated for each sub-block. So a total of 128 bin values are generated. To form key point descriptor it is represented as a vector.

- *Key point Matching*

Key points between two images are matched by identifying their nearest neighbors. But sometimes, the second closest-match may be very near to the first.

B. Neural Network (NN)

There are two main stages in a classification system:

- Training stage
- Testing stage
  - ➢ In training section, classifier learns its own classification rules.
  - ➢ In testing phase, the feature vectors of a query image takes as input. Detecting of lung cancer for hybrid model performed well in categorization in medical field.

Following the diagram design of classification system.

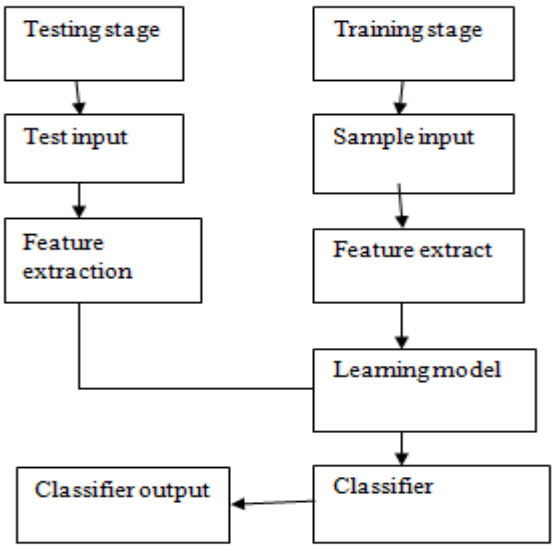

Figure.2 Design of Classification system

Machine learning algorithms facilitate a lot in decision making and neural network has performed well in categorization purpose in medical field. Most popular techniques among them are neural network [24]. Neural networks are those networks that are the collection of simple elements which function parallel. A neural network can be trained to perform a particular function by adjusting the values of the weights between elements. Network function is determined by the connections between elements. There are several activation functions that are used to produce relevant output.

C. SVM (Support Vector Machines)

Support Vector Machine (SVM) also called Support Vector Networks are supervised learning models that analyze data and recognize patterns. SVM models represent examples as point in space mapped in manner that separate categories examples are divided by a gap thereby performing linear classification. Apart from this SVMs can also perform nonlinear classification using Kernel trick [6].

The main idea of SVM is that; it finds the optimal separating hyper plane such that error for unseen patterns is minimized. Consider the problem of separating the set of training vectors belonging to two separate classes.

D. Purposed Algorithm: HYBRID (N/N+SVM)

Step 1 Initialize training set
Step 2 for i=1: length(training set)
Target(1)=i
END
Step 3 Net=new ft (training_set,set,target,10);
Net=train(net,test_set);
Train the network based on training set
Step 4 FOR i=1:length(training_set)
Groups(1)=i;
END
Step 5 net=sim(net,test_set)
Simulate the network for trains after applying neural training
Step 6 SVMstruct+SVMtrain (training_set,groups using SVM train for support vector mach
Step 7 then classify the samples based on train test set and groups
Step 8 END

- Normal
- abnormal

It includes some impressions that are not contained in the training set. The following images are some examples for the different classes of expression:

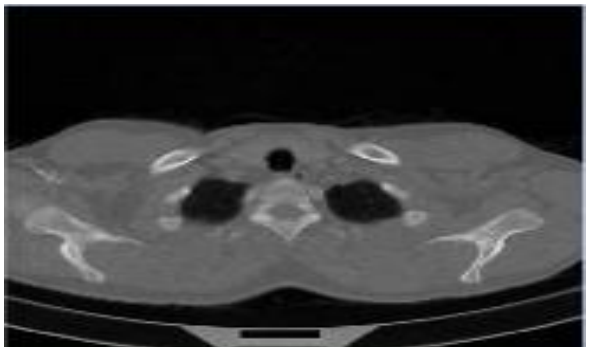

Figure 3: Normal

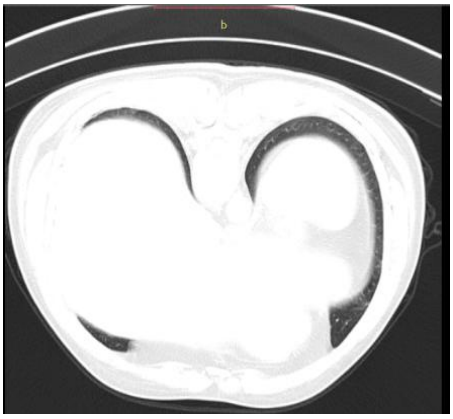

Figure 4: Abnorma

A. Computation Parameters

- *Accuracy*: It is measured by the ratio of the total number of correctly classified pixels to the number of pixels in the image. Accuracy evaluates the overall correctly classified pixels.

$$\text{Accuracy} = \frac{TP+TN}{(TP+TN+FP+FN)}$$

- *False Rejection Rate***:** It is the probability that an identified pixel is a true positive.

$$\text{Positive Predictive Value} = \frac{TP}{(TP+FP)}$$

- *False Acceptance Rate*: It is the probability that an identified pixel is a true negative.

$$\text{False Predictive Value} = \frac{FP}{(FP+TP)}$$

III. RESULTS AND COMPARISON

IMAGE	SVM	N/N	HYBRID
1	80.413	97.7299	98.9785
2	61.236	97.724	98.9753
3	61.341	97.8455	98.98
4	80.721	97.6226	98.9923
5	61.341	97.872	98.98

Table 1: Accuracy

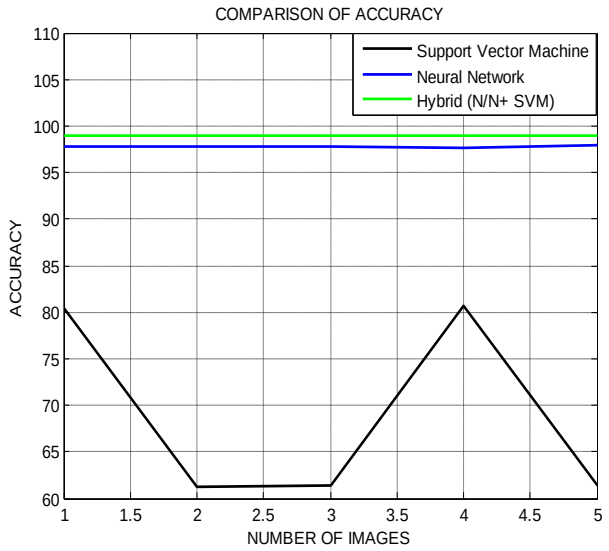

Figure 5: *Comparison of Accuracy between NN, SVM and NN+SVM*

From the graph it has been seen that green line is for SVM+NN, Black line is for SVM and Blue line is for NN. It has been clearly seen that FRR fpr hybrid model is best in terms of value as it has been found to be approx. 0001.

IV. CONCLUSION AND FUTURE WORK

Lung cancer malignancy is usually a sickness that occurs due to out of control cell or portable progress throughout areas with the lung. This progress can lead to metastasis, that's the breach of nearby cells and infiltration over and above the lung area. Cure and treatment depend on the histological style of cancer malignancy, the point (degree of spread), and also the patient's functionality status. Probable treatment options include things like surgery, chemotherapy, and radiotherapy. Survival will depend on onstage, all around health, along with other elements, however all round merely 14% of men and women diagnosed with lung cancer malignancy. A database file consisting of 30 images has been used for training set. Feature extraction has been done using SIFT features. After that classification will be done using Neural Network Algorithm and SVM algorithm. It shows the best results with highest TP Rate and lowest FP Rate and in case of correctly classification, it gives the 96.04% result as compare to other classifiers. Prognosis of early diagnosis of Lung cancer with BPNN models has the best performance in large data sets for SVM classifier the accuracy of this proposed method is 97% by using neural and by using SVM it is 83 % and I purposed the (hybrid) N/N+SVM best performance 98%.

The future scope can be taken as below:

- The million order dataset can be chosen and image classification should be possible on bigger dataset. With expanded size of dataset different issues, for example, uploading image, overseeing feature set, expanded execution time of classification algorithms and so forth can be considered.
- More image features can be separated for better classification. Hybridization of previous components can be used to effectively characterize restorative information.
- The specialists can put their accentuation by executing ANT COLONY in the mix of the NEURAL

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