

## Breast Cancer Detection Using Neural Network

S.Nadiger<sup>1\*</sup>, A.Dixit

<sup>1</sup>Ise, SDM College of Engineering and Technology, Dharwad, India

<sup>2</sup>Ise, SDM College of Engineering and Technology, Dharwad, India

\*Corresponding Author: [shrutinadiger.7@gmail.com](mailto:shrutinadiger.7@gmail.com), Tel.:8884054830

Available online at: [www.ijcseonline.org](http://www.ijcseonline.org)

Accepted: 10/Jul/2018, Published: 31/Jul/2018

**Abstract**— The aim of this project is to detect breast cancer by extracting the features of the affected tumour. Classification of the cancer cells is done with neural networks. The project consists of three phases namely, pre processing, feature extraction and classification. Pre processing is done using median filter; the features are extracted from digital mammogram which includes position, texture and shape. The features are trained by neural networks to classify the cancer cells. Maximum likelihood estimation is used to calculate the area affected to determine the depth of tumour. In this paper artificial neural network are used to develop a system for diagnosis, prognosis and prediction of breast cancer. Breast cancer is a type of cancer originating from breast tissues, and most commonly this is originated from the inner lining of milk ducts. Breast cancer occurs in human and other mamma is also. Cardiology, radiology, oncology, urology are currently the burning areas in medical sciences in which neural networks are currently progressing on.

**Keywords**—Breastcancer,malign,benign,MLE,Pre-Processing,DWT,Digitalimageprocessing

### I. INTRODUCTION

Breast cancer is the most frequent cancer in women the disease is curable if detected early enough. The disease is curable if detected in early stages. Screening method is carried out on the basis of mammograms, x-ray images are used to reveal lumps in the breast. The existence of tumour is occurred by calcium deposits. Digital mammography is currently as standard procedure for breast cancer diagnosis, various techniques are used for classification problem in the area of medical diagnosis. Feature extraction of image is important step in mammogram classification. These features are extracted using Digital Image Processing. MLE and DWT are used to calculate the area and also showing the cancer affected areas. Tumour cells as white in colour. Breast cancer is a type of cancer originating from breast tissue. Texture features have proven to be useful in differentiating normal and abnormal cells. Extracted texture features provide information about textural characteristics of the image. Breast cancer is a type of cancer originating from breast tissues, and most commonly this is originated from the inner lining of milk ducts. Breast cancer occurs in human and other mammals also.

Cancer is a board group of disease involving unregulated cell growth. The cell divides and grows abnormally forming malignant tumors, through the lymphatic system or blood steams cancer can spread all through the body. The cancer cell can be divided into benign and malignant. Benign tumors do not invade neighboring tissues

and do not spread all over the body, it is the not a cancerous tumor. Adenomas, fibroids, lymphomas are common type of benign tumors. Malignant tumor forms in the cells of the breast. Malignant tumors are formed from abnormal cells that are unstable and grow via the blood stream. Sarcomas, carcinomas are common type of malignant tumors. Cancer can be detected in different ways, including the presence of certain sign and symptoms, screening test, or medical imaging. Common environmental factors include tobacco (25-30%), diet and obesity (30-35%) infections (15-20%) radiations, hereditary, are the reasons for causing cancer.

### II. RELATED WORK

This paper presents the detection of breast cancer by neural network. Artificial neural network used in medical diagnosis for decision making system [1]. ANN is verified using data set. It can be used as robust decision making system. It gives complex input and output relationship. ANN has basically three layer input layer, hidden layer, output layer [1]. Here input is the discrete values at different nodes and output is the signal produced after processing input values. In the neural network, the nucleus of the neuron, the summation of all weighted input with bias takes place. At the output the value obtained by summation of all weights and bias input is converted to activation signal using transform function. The learning algorithm is trained along with neural network to solve given problem [2]. Neural network is basically a

mathematical model motivated by biological nervous system like brain processes information. It uses connectionist approach to process information and is formed of interconnected stimulated neurons and it changes its structure in learning phase which works like adaptive system [2]. Pattern categorization and data classification are the application designed by neural network. The construction of neural network involves three layers with feed forward architecture. The input layer is the set of input units, which accept the elements of input feature vector which is connected to hidden layer with hidden units which are connected to output layer. The output layer then supplies the response to the neural network to activate the pattern applied to the input layer. The information is passed layer by layer from input layer to output layer through one or the more hidden layers [3]. Network with one hidden layer is sufficient to solve to solve the problems.

### Neural Network as Breast Classifier

Neural network has been used in various fields like artificial intelligence, pattern recognition and medical diagnosis [3]. Pattern recognition is class of problem which neural network is suitable for solving problem. Neural network can be used in mapping from input to output. If each different input is regarded as a kind of input mode, the mapping to the output is considered as output response model, the mapping from input to output is issue of pattern classification [4]. The learning algorithm of neural network is a supervised learning by training feedback neural network using back propagation which is used to determine the parameters of neural network. Breast cancer data classification has few steps of using neural network learning algorithm. Firstly the network prediction of each sample is compared with actual known class label through the provision of training samples and class of sample and then the weight of each training sample is adjusted to achieve the purpose of classifying other sample data [4].

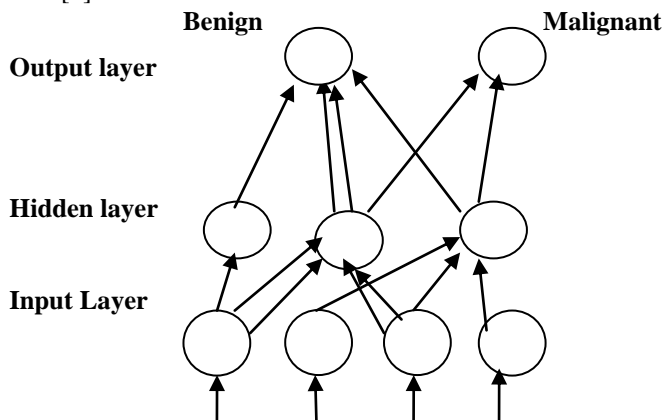


Figure 1. Neural network topology

In the above fig the neural network topology each node in the network corresponds to the output node of network unit, input are the real lines from the bottom into node.

### III.METHODOLOGY

The below diagram shows the differentiation between the tumour cell and normal cell. The figure 2 explains the different stages for the early detection of breast cancer.

**Database of mammogram:** The digital database for screening mammography (DDSM) includes two image for each breast study, ACR breast density for abnormalities and image information.

**Maximum likelihood estimation (MLE):** it is used as a parameter for the estimation of a statistical model and also provides the estimation for the models parameter. It helps to distinguish between tumour and non-tumour cells, and to classify regression model is applied. This method selects the set of values of the model that maximizes the likelihood function. MLE was originally developed by R.A Fisher that describes the probability distribution is the one that makes the observed data most likely which means once you seek the value of parameter vector that maximizes the likelihood function. MLE gives the unified approach to estimate, which is well defined in the case of normal distribution.

**Discrete wavelet transform:** A wavelet is the transformation of signal into a set of basic function and these basic functions are called wavelet. The main use of wavelet approximation is in data compression. Wavelet are obtained from single prototype wavelet  $y(t)$  called mother wavelet by dilatation and shifting. Discrete wavelet transforms which transform a discrete time signal to a discrete wavelet representation.

**Breast density:** The area of breast is calculated by MLE and DWT. This also shows the portion of affected tumour. Area is calculated by pixels.

**Pixel:** A pixel is generally thought of as smallest single components of a digital image. Pixel is unit of measures of resolution. The measure dots per inch (dpi) and pixels per inch (ppi) are sometimes used interchangeably.

**Pre-processing:** Digital image pre-processing is the techniques of enhancing data images prior to computational processing. Here the output is said to have been pre-processed from input data. Pre-processing methods use a small neighbourhood of a pixel to get new brightness value in output image. Such pre-processing operation is called filtration.

**Image pre-processing:** Image pre-processing is a method to convert an image into digital form and perform some operations in order to get an enhanced image or extract some useful information on it. The input is taken as image like photograph and output may be characteristics associated with

that image. Image processing basically includes the following three steps:

- 1 Importing the image with optical scanner or by digital photography.
- 2 Analyzing and manipulating the image which includes data compression and image enhancement and spotting pattern that are not human eyes like satellite photographs.
- 3 The last stage is in which the result can be altered image or report that is based on image analysis.

**Image enhancement:** The principal objective of image enhancement is to process a given image so that the result is more suitable than the original image for specific application. The image enhancement doesn't increase the inherent information content of the data, but increases the dynamic range of the chosen features so that can be detected easily. Image enhancement methods can be based on either spatial or frequency domain techniques.

**Image Segmentation:** Image segmentation is a mid-level processing technique used to analyze the image and can be defined as processing technique used to classify or cluster an image into several disjoint parts. The classification is based on characteristics like gray level, color, texture, intensity and other features.

**Morphological Operations:** Morphological image processing is a collection of non-linear operations related to the shape or morphology of features in an image. Morphological operations can also be applied to greyscale images. Morphological techniques probe an image with a small shape or template called structuring element. The structuring element is small binary image i.e a small matrix of pixels, each with value zero or one.

**Intensity Based Features:** Intensity based features are the first order statistics depends only on individual pixel values. Mean and standard deviation are the features which can be measured by intensity and its variation inside the mammogram.

**Mean value:** The mean value gives the average intensity value of an image. Mammographic image contain micro calcification have a higher mean than those of normal images. Mean is calculated as  $\bar{\mu} = \frac{1}{M \times N} \sum_{i=1}^M \sum_{j=1}^N p(i,j)$ , here "i" indicates row of the image "j" indicates column of image, and  $p(i,j)$  is denoted by the row and column of the image.

**Standard value:** standard deviation is a parameter closely associated with mean.

**GLCM Features:** The gray level co-occurrence matrix (GLCM) texture measurement is a method to analyze image texture. The GLCM matrix is a tabulation of how often different combination of gray level occur in an image.

**Energy:** Energy represented the orderliness of a mammographic image. Energy is generally given by the mean squared of a mammographic image.

**Entropy:** The amount of disorder in a mammographic image is called as entropy. Micro-calcification has high value of entropy

## BLOCK DIAGRAM

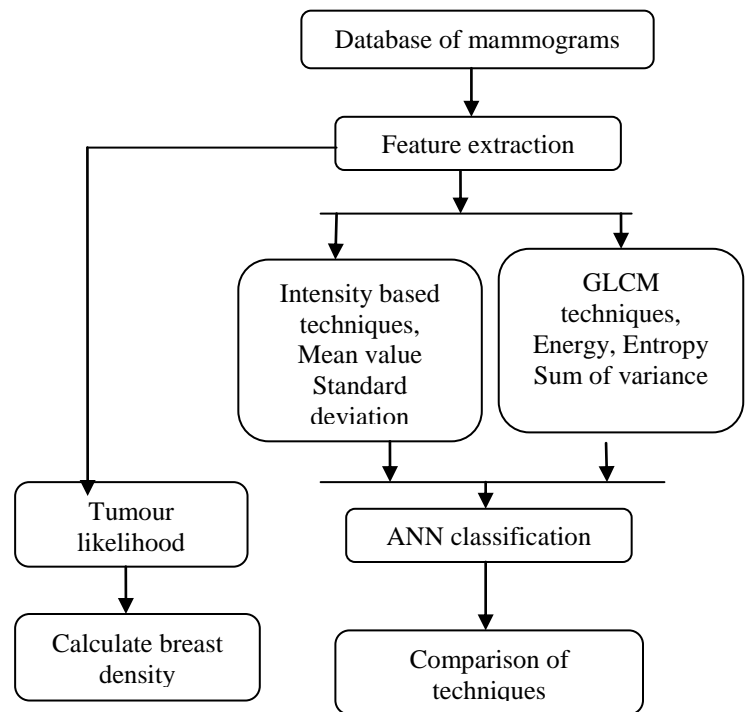


FIGURE 2. BLOCK DIAGRAM FOR DIFFERENTIATING TUMOUR AND NORMAL CELLS

## IV. RESULTS AND DISCUSSION

Differentiating normal cells and tumour cells helps to calculate the area of tumour affecting portions. The area of affected tumour is calculated in unit pixel by maximum likelihood estimation (MLE) and Discrete wavelet transform. Intensity based technique helps to determine the mean value, standard deviation. GLCM technique helps to determine energy, entropy, contrast, correlation, homogeneity and sleekness.

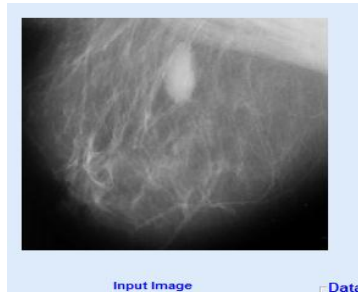


Figure 3. Input image

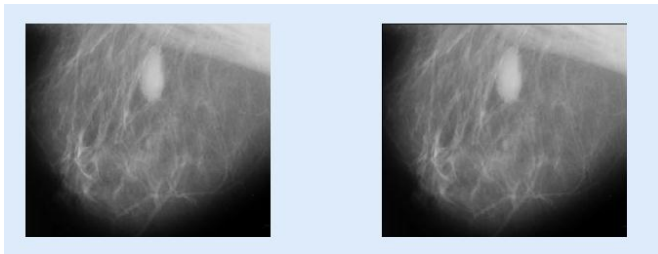


Figure 4. Input image with pre-processing image

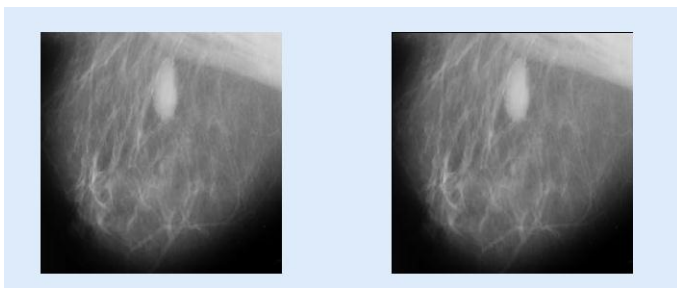


FIGURE 5. WAVELET IMAGE

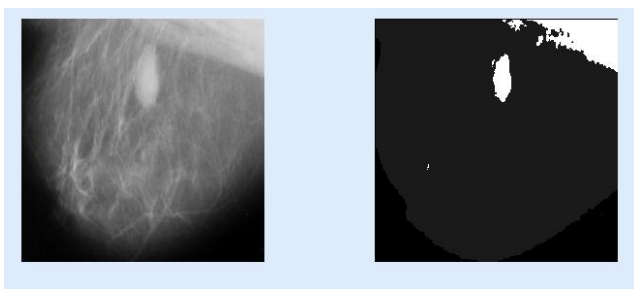


Figure 6. Image differentiating tumour and normal cells

Intensity based and GLCM techniques are used to calculate energy, entropy, contrast, correlation, homogeneity and sleekness, for GLCM contrast is 0.048442, homogeneity is 0.986861, correlation is 0.990888, energy is 0.555255, entropy is 0.999986, skweness is 1.41176. For intensity based techniques mean is 34.3779 and standard deviation is 57.4773

## V. APPLICATIONS

### 1. Overview of neural network in medical diagnosis:

ANNs have been useful in medical field for various diagnosis such as colorectal cancer, multiple sclerosis lesions, colon cancer, pancreatic disease, gynaecological diseases, early diabetes etc. It is also used in gastroenterology for the analysis of data and classification of diagnosis. Learning quantization ANNs have been useful in developing novel, general and fast adaptive disease diagnosis system. ANNs has been useful in diagnosing disease like cancer and cardiovascular which are common in today's life. The data being collected from clinical and instrumental side is too large therefore development of tools to provide diagnosis is of great relevance. A correct and rapid diagnosis is necessary for the clinical management of cancer. The use of ANNs in distinguishing the different type of cancer emerged in the late 1990's. Earlier they used many approaches for the detection of cancer such as micro-RNA screen. This project in which ANNs deals with trained data set evolved in 1994's for breast and ovarian cancer which gave a discussion on suitability of particular data as input for the ANN analysis example radiological, ontological. Later advance techniques were developed that can be suitable for the ANN's analysis.

**2. Character Recognition:** The hand written characters are recognized by the neural networks. This is related to pattern recognition. Multilayer neural networks such as back propagation neural network and Neocognitron. Neural networks play a vital role it character recognition. Through back propagation neural networks have several hidden layers. The layers are localized from one layer to another layer. ANN's are localized with hidden layers.

**3. Forecasting:** Forecasting is used in everyday business. ANN's play a important role in forecasting. Forecasting is complex problem for example economic, predicting stock prices is one of the complex problem. ANN's is applied to complex non-linear relationship where it provides a robust alternative solution by taking model and extracting features and relationship. ANN's doesn't affect the input and model distribution

## VI. CONCLUSION AND FUTURE SCOPE

In this research digital mammography is currently a standard procedure for breast cancer diagnosis. Earlier various other techniques were used for the detection of breast cancer and for the classification. This research for the diagnosis of breast cancer using feature extraction of image which is important step in mammography classification. These features are extracted using image processing techniques. Area of affected tumour is calculated by maximum likelihood estimation and discrete wavelet transform. The normal and

cancerous cell is differentiated using the classifier. Tumour is classified into three classes benign, malignant and normal. Breast cancer has been frequent cancer found in women; the disease has been curable if detected at early stage. Screening method is carried out on the basis of mammograms. This disease is curable if detected at early stage. Digital mammography detects the affected tumour at early stage. Entropy, mean, standard deviation, energy, skewness etc is calculated from the database image using the MATLAB software.

#### ACKNOWLEDGMENT

The authors would like to thank SDM College of engineering and technology for providing their support throughout the Project also the research panel for providing all the support and materials required

#### REFERENCES

- [1] A. Jemal, F. Bray, M. M. Canter, J. Feraly. et.al, "Global cancer statistics," A cancer journal for clinicians, 2011.
- [2] A. Malich, D. R. Fischer and J. B. Ottocher, "CAD for mammography: the technique, results, current role and further developments," European radiology, 2006.
- [3] K. Kelley, J. Dean, W. Comulada. et.al, "Breast cancer detection using automated whole ultrasound and mammography in radio graphically dense breasts," European Radiology, vol.20, pp.734-742, 2010.
- [4] M. B. Dillencourt, H. Samet and M. Tamminen, "A general approach to connect-component labelling for arbitrary image representation".
- [5] N. F. Boyd, H. Guo, L. J. Martin, L. Sun, J. Stone, E. Fishell. et.al, 2007.