

# Premature interlude detection and classification of breast cancer using ANN classifier

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## Abstract

Breast cancer has emerged as the main reason behind most cancers deaths among women. To decrease the emerging issue, cancer should be handled at the early stage, however it's extremely complicated to discover associated diagnose tumors at a premature stage. Manual analysis of cancer is found to be extremely time consuming process and incompetent in several scenarios. As a result, there exists a choice for sensible schemes that identifies the cancerous cell, simultaneously deprived of any participation of people and with excessive accuracy. Here, formulated automatic method victimization Artificial Neural Network (ANN) as better intellectual system for breast cancer classification. Image Processing takes part a vital place in cancer recognition once input document is inside the style of pixels. Feature extraction of image could be very vital in Mammogram classification. Alternatives feature extraction methods have been developed recently. An absolutely distinctive function extraction method is used for classification of conventional and Normal cancer image classification. This methodology can offer maximum accuracy at a high speed. The applied math parameter encompass entropy, mean, power, correlation, texture, variance. This constraints can act as a inputs to ANN which is adequate enough to identify and provides the outcome whether or not patient is suffering from cancerous or not.

**Keywords:** Artificial neural network, image processing, statistical parameter.

## 1. Introduction

At present, breast cancer has come to be the foremost reason of cancer bereavements among women. Consistent with latest studies about one in eight women in US broaden breast cancer [1]. Premature discovery of breast cancers is very important. Breast image evaluation is appearing in lots of methods. Moreover, Digital mammography is the frequently used for breast most cancers detection. Labour-intensive analysis completed through using oncologist will no longer provide outcome with supreme accurateness. Moreover, it is extremely time consuming. Here, provided the automated discovery of breast most cancers the usage of image processing schemes and artificial neural network (ANN). Mammogram image graphs have considered from MIAS (mammography image analysis society). Picture processing consists of diverse strategies to enable the virtual mammogram image ultimate for ANN community. Initially, the input image is processed with pre-processing, image enhancement, noise removal, image restoration, object recognition, segmentation and feature extraction. It must be noted that the statistical constraint is significant step in mammogram classification. The superiority extracted function is texture constraint, by means of which the irregularities can be identified with any concern.

Texture is a technique for the purpose of extracting pattern. Statistical constraints comprise texture, entropy, mean, fashionable deviation, electricity, correlation. This constraint could be provided as input to the particular classifier. There are specific classifiers employed for the purpose of investigation of

different types of cancer. ANN is the main classifier employed in recent times. ANN is employed for the purpose of classification among cancerous and noncancerous images. The layout and experimentation is finished using Matlab.

## 2. Related work

Prof Seema singh and Sushmita H [1] has formulated an efficient neural community primarily in accordance with the device for prognosis of breast most cancers. Here the author has carried out a well-organized neural network for analysis of breast most cancers. They described the supervised and unsupervised schemes which examined the maximum well-organized opportunity for finding breast most cancers identification. They employed back propagation techniques. The comparisons of various categories of classifiers are also included in their research.

B. M. Gayathri, C. P. Sumathi and T. Santhanam [2] have given a survey on breast cancers diagnosis with the machine learning schemes. They shortened the investigation on breast cancers diagnosis the usage of different machine learning schemes and approaches that are employed to enhance the accuracy of predicting cancer. This assists in recognising regarding the range of papers which might be implemented for the purpose of diagnosing the breast cancer.

Chandra Prasetyo Utomo, Aan Kardiana, Rika Yuliwulandari [3] had worked on breast cancer analysis the usage of ANNs with excessive learning strategies on this studies, they have employed ANN with excessive machine learning strategies for the purpose

of detecting breast cancer using wisconsin dataset. Outcomes confirmed that ELM-ANN has better generalization classifier prototype than BP ANN.

Minavathi, Murali.S, M.S. Dinesh [4], provided research on classification of types in Breast Ultrasound mammogram the use of image Processing techniques. Within the proposed technique, ultrasound images are preprocessed using Gaussian smoothing to dispose of additive noise and anisotropic diffusion filters for the purpose of casting off multiplicative noise. Lively contour approach is effectively employed for the purpose of extracting a closed contour of filtered picture that's the borderline of the spiculated mass. These spiculations are amorphous or abnormal are marked through measuring the perspective of bend of each pixel on the borderline of mass.

R. Nithya, B. Santhi [6] has compared the observation on feature extraction scheme for breast most cancers type. They provided three specific feature extraction strategies that may be depth histogram, grey level co-prevalence matrix (GLCM) and depth primarily in accordance with the capabilities for classification of everyday and bizarre styles in mammogram. These strategies come beneath texture measure. The outcomes are demonstrating that GLCM capabilities based totally neural community is giving better classification accuracy of 98%. Here, a supervised classifier machine learning based totally on neural network is employed.

Ashmitha Khaleel Khan & Noufal P [9] have formulated the Wavelet based computerized lesion detection scheme with the use of stepped forward lively contour approach. Here, they formulated a way-enhanced lively contour scheme that allows in the segmentation technique for lesion recognition. Here, the segmentation is done before pre-processing and discrete wavelet transform of image is done first. Average filter has been employed here for the purpose of improving the image clarity and the wiener filter is employed for the purpose of noise suppression.

Chethan K, Dr. Krishna A N [10] offered detection of breast cancer in digital mammograms with the use of more than one concentric layers. Here, the application of more than one concentric layer (mcl) is effectively used for the purpose of mammogram segmentation. Here, this approach possessed the automated detection of cancer in digital mammograms. Effectively execute the image to array converter, at that time the image can be effectively segmented. Following this, binary mask image are characteristically acquired through thresholding process from the gray scale image. The image granulation phase regulates that group of pixels which are sturdily linked based on spatial region and depth variety.

In the above discussed works and research , an associated work through quite a few researchers, schemes of discovery of breast most cancers has been defined with exclusive scheme, strategies and outcome with correct accuracy, however the processing is turned out to be complex because the standards they have got employed is hard. Consequently, in order to overcome this difficulty this paper has covered the novel idea of statistical constraint investigation wherein constraints are mined for the purpose of classification. These constraints are adequate enough to acquire better accuracy than other systems. Moreover, it's using ANN community classifier for analysis reason. This paper provides the automated method of detection of breast cancer.

### 3. Methodology

#### Input dataset

Here, 51 virtual Mammogram X-ray Image Dataset (MIAS) is effectively employed. It includes 19 cancerous images and 32 non-cancerous images. These images are usually broken through wide variety of noises, which adequately disturb the uniqueness of image. The image can be of colour quality also. Consequently, the input picture can't be at once given directly for processing.

#### Pre-processing

Biomedical images are typically consisting of numerous categories of noises. Eliminating noises without deteriorating the preferred data is mostly a good sized project. Pre-processing images normally entails doing away with low frequency from related noise. Virtual image pre-processing is the strategies of effectively augmenting statistical data in advance of computational processing. Pre-processing techniques use a minor community of a pixel to change to a brand fresh brightness range in output image. These pre-processing operations are known as Filtration. Moreover, the input image can be colour image, consequently the image is transformed to grey image initially. This grey image is pre-processed to remove the noise. This image transformed into more suitable form for processing that will be able to be extracting accurate image data for research in subsequent step. All the input data has been re-dimensioned to perfect dimension for which this system has evolved. Noise removal is by way of using Median filter out, this filtering approach considerably diminish 'salt and pepper' noise, put off the noise and maintain the edges. Direction of image is determined to several individual side whenever input image has obtained as certain snap shots are of proper facet and a few are of left aspect.

#### Image enhancement

It is to be noted that the pre-processed image has several unwanted white spots/pixels inside the non-focused region. All the image comparison restriction will increase or stretches on the way to obtain the suspicious object so as to examine non-focused item through providing the pixel greater intensity threshold value. The undesirable pixel inside the unwanted place needs to be eliminated, and that a portion of image is masked. The masks advent of image is done. Subsequently the output image is generated through the way of reproducing reference image and masked image and the dimension of the image is in length of 8 bit.

#### Segmented image

Segmentation is the method of transforming an image into more than one segment that is collection of pixel additionally refers as first rate pixel. This process is to make simpler and exchange the illustration into some degree that is extremely meaningful and simpler to investigate [5]. The dubious gadgets are diversified from historical past objects and boundaries in image. The white shadowed portions i.e. the irregularities exist inside the breast area will be found. It consists of the circumstantial subtraction technique. Subsequently, thresholding is employed effectively. Gray threshold selects the threshold for the purpose of reducing the intra class variance of the threshold black and white pixels.

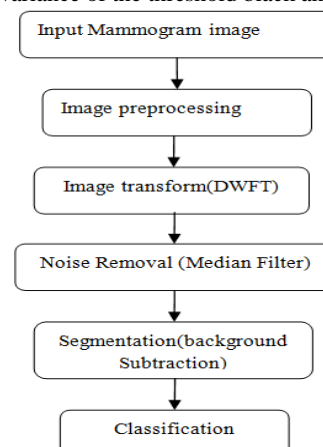


Fig 1: Flow diagram showing overall methodology

## 4. Statistical parameter analysis

Statistical parameter assists the radiologists to acquire extra details to diagnose the breast most cancers. This analysis is the kind of development approach of discovery of cancer. If the input information is simply too enormous and it's miles to be extremely redundant.

Statistical parameters are a technique of taking image contents from image. The major intention of feature extraction method is to symbolize original image in its condensed form for the purpose of facilitating choice making manner including pattern class [7]. Texture parameter is obtained from the mammograms which are employed to trim the classification result. Some features are extracted from image that allows you to use a suitable classifier to discriminate in the middle of normal and strange pattern. The irregularity may be diagnosed on the foundation of textural look. The obtained features are provided to neural classifier to educate it. The capability of the classifier is to find the mysterious data to the right way depending on the obtained functions. This could provide most precise result. The superior characteristic obtained is texture characteristic. The following parameters are computed to give as an input to neural network.

### Power

Electricity indicates the regulation of a mammographic image. Electricity is typically provided by means of the suggest squared of an image.

Here, Gabor wavelet is employed for the purpose of measuring electricity characteristic for figuring out gabor functions of a grey-scale image. Gabor wavelet characteristic computes gabor capabilities. Imply-squared power & imply amplitude for every single scale and alignment is lower back.

$$\text{Energy} = \sum_{i=1}^n x(n)$$

### Textures

Texture capabilities are extensively employed in mammogram class. The feel characteristics are capability to differentiate among regular and extraordinary sample. Texture is a modification and version of ground of the image graph. In trendy, texture may be characterised as the distance circulation of gray stages in a neighborhood. Its characteristic is verified to be valuable in discriminating regular and unusual pattern. A texture is a way of apprehending pattern inside the image graph. Gaussian filter out is employed for the feel degree. Its formula is,

$$\text{Texture} = \int_{-\infty}^{\infty} x(n) / (n - v)$$

### Standard deviation

Standard deviation is a constraint intently related with the mean. Those talk to the spreading of values in a virtual mammographic image all over the imply value. Standard deviation is given as,

$$\text{Standard deviation} = \sqrt{\text{mean}}$$

### Mean

The mean cost provides the common strength cost of an image. Image that incorporate micro-calcification possess a higher suggest than those of everyday snap shots. It is computed through,

$$\text{Mean} = \frac{\text{number of pixel}}{\text{Total number of pixels}}$$

## Correlation

It is the associations among objects that manifest or transform mutually.

## Entropy

The quantity of chaos in a mammographic image is known as entropy. This value is disproportionate in micro calcification. Since, the kind of intensity values in the image is too much as a consequence of the existence of white calcification predicaments. It is given as,

$$\text{Entropy} = -\sum_{i=0}^n x(n) \log x(n)$$

## 5. Classification

It consists of three layer synthetic neural network. The formulated approach makes use of the supervised method for learning the network. The illustration of neural network includes 'n' inputs, 'm' hidden devices and one output unit. The foremost objective is to group the fragmented image by taking the statistical constraints that's mentioned within the preceding segment. A neural network is a hard and fast of related input/output system where every linking has a weight related to it. It is trained through regulating the weights to be able to be capable of expecting the right magnificence. The network considers the two essential constraints, one is information characteristic and the other is information magnificence. Data capabilities are the functions that have been computed inside the aforementioned segment and records the class are cancerous and non-cancerous. The output is 1 for cancerous and -1 for non-cancerous.

The major purpose of ANN employed for classification is it possess correct capability of generalization. This way, is split into the training section and the checking out segment. In the education section regarded records are given. Inside the trying out phase, unknown information is given and the class is accomplished the usage of the classifier following the training. The accuracy relies upon on the performance of the machine learning.

## 6. Results and discussion

This system has employed the mammogram images as the input. Subsequently, the image is processed with few schemes which are discussed above to get the accurate output. The following figure indicates the raw image, after that is initial half of image, subsequently another half of image for the purpose of deciding the path of image.

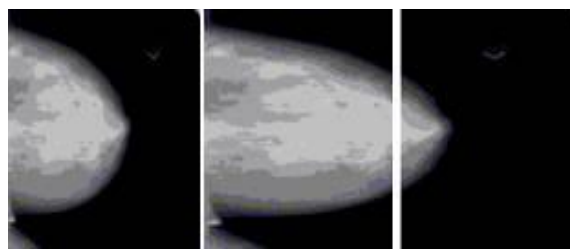


Fig. 2: Original image, first half of image, second half of image

The next figure demonstrates the image at left side as path of image is concluded as left side, at that time masked objective image & its value is computed. This masked image is the one doubtful region which is to be computed with precise to pixel intensity.

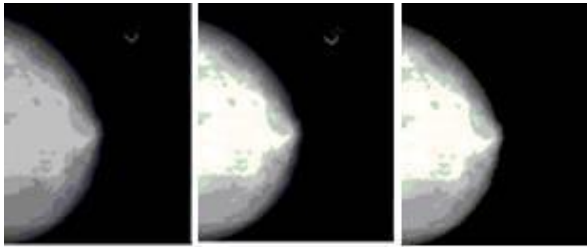


Fig. 3: Imaged at left side, masked target image, mask image

The successive figure demonstrates the enhanced image and the segmented image. The initial image is the pre-processed image with noise eradicated and its evaluation limit is fine-tuned and in segmented image, the area of interest is obtained.

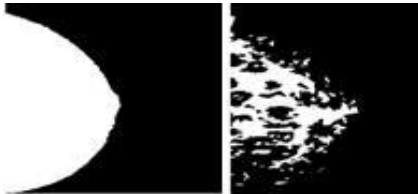


Fig. 4: Enhanced Image, Segmented image

The figure 4 displays the outcome whether the input image is cancerous or non-cancerous. The classification of cancer is effectively carried out by ANN. Henceforth, this system has magnificently sensed the Breast Cancer.

## 7. Conclusion

Most cancers are the maximum common disorder in women in several parts of the world. Premature discovery of cancer can decrease the death rate. Here, a novel scheme is employed for the purpose of premature detection. In order to effectively identify, initially the noise must be eradicated from the image using pre-processing techniques. Filters are employed for the purpose of enhancing the brightness of features of the image, and provide improved sharpness. Then, the segmented image prepared for statistical constraint, at that point the extracted feature will be the input to ANN. This system correctly executed greater than 90% accuracy that is taken into consideration as an excellent result while in comparison with other recent related works.

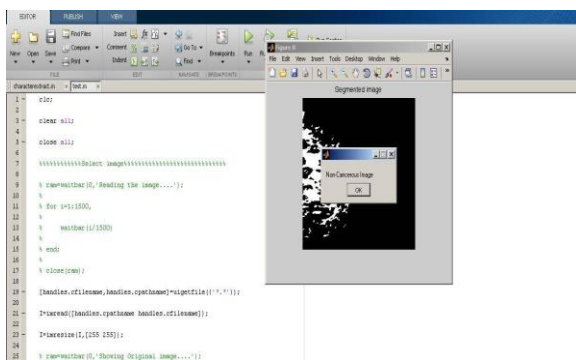


Fig. 5: Screen showing the result output

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