DETECTION OF MAMMOGRAPHIC CANCER USING SUPPORT VECTOR MACHINE AND DEEP NEURAL NETWORK

Timmana Hari Krishna\textsuperscript{1}, C. Rajabhushnam\textsuperscript{2}

\textsuperscript{1,2}Department of Computer Science and Engineering, Bharath Institute of Higher Education and Research, Bharath University, Channai, TamilNadu, India.

\textsuperscript{1}harikrishna.timmana@gmail.com, \textsuperscript{2}rajcheruk@gmail.com

Corresponding Author: Timmana Hari Krishna

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Abstract

Cancer is a disease which is usually happens among the individuals everywhere throughout the world. There are numerous reasons to happen the malignant growth like as various habitats, environmental disorders and so forth. Cancer growth being identified at beginning periods can saves a large number of peoples, if viable cure is specified. It can make harm any piece of body. Generally the cancer occurs in breast of ladies. When a breast cells divide rapidly, it creates a group of mass which is called tumor. It is very difficult to detect the breast cancer tumor, it is very challenging task. Also the structure of the cancer cells are very complicated. In this article a prediction of breast cancer is present. In this a deep learning support-vector-method (D-SVM) is used to identify the breast cancer tumor. Also, In a early stages of an mammographic cancer a segmentation to threshold method is used. For the classification and for the feature extraction purpose this D-SVM method is used. In this method we integrates conventional support vector machine (SVM) & classifier deep-neural-network. Likewise, probability of the lump to differentiate its sort is additionally taken in this paper for example amiable, suspicious or harmful.

Keywords : Malignant, Image Processing, Support Vector Machine, Feature Extraction, Deep Neural Network.

I. Introduction

The uncontrolled multiplication of a cell form a tumor in the particular area of a person. This group of cell rapidly divides the cell and form a lump called tumor. These are the malignant tumor which are developed in the breast and generated from the breast cells. Due to the breast cancer major women causes death and in females it is the second most common disease. But, if the effective treatments and better diagnostic facilities are provided to the breast cancer patient it can be reduced. The screening mammography is one of the diagnostic method which is used to cure the
breast cancer. In this screening mammography diagnostic method X-rays are utilized for detection of tumor [XXVI].

As of now, clinical data & microarray of bosom disease be complex to obtain which could limit the improvement of calculated procedures. Yet, by means of a progressing improvements of cutting edge sequencing developments, it is by and by probable to quickly & broadly survey a ton of characteristics and tests to instruct bosom malignancies sicknesses assurance, estimate and potential response to treatment. Most of hard work are taken to cure the breast cancer in last few decades. These efforts are done on the basis of effectively understanding the gene appearance[XVI].

The micro calcifications, architectural distortions and masses are used to detected the premature phase of breast tumor & this be the mainly significant symbol for detection of tumor. Once the breast cancer tumor is identified then the option for the treatment open and it increase the rate of survival. But, to find these suspicious abnormalities and screening process of a breast cancer tumor involves the human factor and due to this there is high possibility to get an error. The cancer in screening studies shows that near about 10%–30% error rate can occurs in most of the women while detecting the breast cancer tumor. This error can increase up to 52% due to misinterpretation, due to the abnormal scanning it can be 43%. Due to this high error rate most of the patient are suffered [XVIII].

This is a result of the way that bogus negatives are an immense issue in screening mammography as premature recognition can diminish management price, instance & adequacy all things considered. False negatives influence every one of the 3 parameters as premature location isn’t an alternative with an inaccurate determination. A most important explanation behind these mistakes is because of the way so as to radiologists rely upon visual examination. For the period of physical screening of countless mammograms, radiologists could obtain effectively worn out, mislaid out a major opportunity essential hints while concentrating the scans. The counterbalance these impacts, incredible attempts is being finished to computerize the procedure of mammographic screening [V]. Mechanized screening of mammograms or PC helped conclusion (CAD) of tumor malignant growth is an immense field of study.

In a medical diagnosis of the breast cancer the Classifier frameworks be broadly utilized[F]. As of late, for different machine learning assignments that demonstrate its viability in learning progressive & dynamic portrayals, a deep learning (DL) has been broadly utilized. The raw information through various layers of abstraction can be stated as abnormal state of abstract representation. In the examination field of deep learning a lot of new innovations have been created, till now. The improvement of General Purpose Computing on Graphics Processing Units (GPGPU) [XII] is also included in this as new preparing strategy. In this paper we planned a method called D-SVM to detect the breast cancer tumor. The traditional SVM classifier method is integrated with DNN model to discover the breast malignancy. For the better representation of an breast cancer tumor a segmentation is used[XXIII].
In segmentation process the image is represents in such a way that this can easily to analyze and become more meaningful. Also the Deep Neural Networks (DNNs) method is used to get an more efficient image data image. It may be utilized to extracts a different features of breast malignancy growth from an image. In this article, a robust scheme for recognition of breast cancer tumor be presents. The investigational outcome shows that the accurate finding of an breast cancer tumor in three different levels(K). These levels are early stage, intermediate stage and final stage. Figure 1 shows the various phases of breast malignancy.

Remaining paper is structured in following way. In the first section the introduction of proposed system is presents. In a second section the material and method used in this proposed article are explained. The investigational outcome are shown in third segment and lastly in fourth segment the conclusion is shown.

II. Resources and Methods Used

This segment represents the resources and methods used for the implementation of this proposed system.

A. Dataset Used

The dataset used for the implementation of this work successfully is METABRIC dataset. There are total 1,980valid breast cancer data is collected in this dataset [XVI]. The images present sin this dataset having multidimensional specifications.

All the images used in this proposed format are in jpeg format. All the operation of this proposed algorithm are implemented on the software MATLAB. The images presents in this dataset having resolution 1024×1024 pixels and 8-bit accuracy.

B. Preprocessing Of Breast Cancer Tumor Image

In the preprocessing stage of this proposed algorithm increase the data of an image. To improve the data of an image ,the preprocessing phase be utilized to improve a data of an picture, it can minimize the distortions presents in the image and increases the different skin texture of an picture which may be utilized for advance study and dispensation.
C. **Resizing Of Breast Cancer Tumor Image**

The breast cancer tumor images obtained from METABRIC dataset having resolution $1024 \times 1024$ pixels and 8-bit accuracy are resized into small size of $512 \times 512$ pixels image. While resizing the different abnormalities presents in a breast cancer tumor image are removed.

D. **Cropping Of Breast Cancer Tumor Image**

After resizing the breast cancer tumor image the cropping is done. In this image cropping step, the breast cancer tumor is cropped from image and other unwanted data presents in the breast cancer tumor image is removed.

E. **Cropped Image Threshold Estimation**

The breast cancer tumor cropped from the previous stage is goes to threshold estimation stage. In this step, the abnormal region of breast cancer tumor image is detected by finding the threshold. This threshold of a breast cancer tumor image can be detected from the equation

$$T = 2^{\log(\text{abs}(C_{\text{max}}))}$$

Where,

$C_{\text{max}}$ – Greatest coefficient of common particulars  

The segmentation is given by,

$$\text{Segmentation} = \begin{cases} 
255 & \text{if } |I| > T \\ 
= 0 & \text{otherwise} 
\end{cases}$$

$I$ – data input

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**Fig. 2. Block Diagram of Proposed System**
F. Deep Neural Network (DNN)

The Neural Network (DNN) be utilized for the prediction of the prognosis of human breast malignancy. It is also utilized for conversation of the hidden layers of a breast cancer tumor image into higher level. The upper level features are obtained from the lower level features from the each layer of an breast cancer tumor image. In the DNN there are three layers are presents namely an input layer, multiple hidden layers and an output layer as given away in figure 2.

A multi-layer feed forward neural network is the Deep neural system (DNN) which incorporates three fundamental parts, to be specific input layer, hidden layers, and an output layer. Every one of the part in DNN among every layer are completely associated.

G. Support Vector Machine (SVM)

An efficient classification technique which is used to resolve the nonlinear problems of a breast cancer tumor image is Support Vector Machine (SVM). This method not only resolve the nonlinear problems but also stuttering breast cancer tumor image characterization and categorization.

H. Extraction of Significant Data

The extraction of an breast cancer tumor data is done in this step. The abnormal region presents in the breast cancer tumor image is detected in this step and for that purpose synchronous row-column clustering is proposed. For identifying other clusters of a breast cancer tumor like as subspace clustering, 2-mode clustering, bi-dimensional clustering & co-clustering a bi-clustering algorithm is presents in this article. This bi-clustering algorithm is very important for two means analysis of data and it is particularly helpful for mining tool of data mining.

The data mining tool be utilize for identifying the different structures of a breast cancer tumor image. In the patterns of a breast cancer tumor different genes are presents and these genes are correlated with each other. Therefore in most of the application the bi-clustering is used for detecting the breast cancer.
II. Investigational Results

In this segment the investigational results of projected system are presents. The one by one execution of the proposed framework is displayed here.

In a diagram 4, the illustration of a feature removal algorithm is revealed. This diagram represents the high-quality discrimination between the (a) Normal phase, (b) Intermediary phase, and (c) Last phase of a breast cancer tumor image.

![Fig. 4. Classic Breast Cancer Tumor Image](image)

In the figure 5 the breast cancer tumor picture is taken from the patient is shown. This picture is taken from METABRIC dataset and acts as a input to the planned structure.

![Fig. 5. Input Classic Breast Cancer Tumor Image](image)
Fig. 6. Cropped Classic Breast Cancer Tumor Image.

Form the picture shown in figure 5, the breast cancer tumor is cropped and removes the unwanted background image which is shown in diagram 6.

Fig. 7. Output later than straight up and flat breakdown of cropped Breast Cancer Tumor Picture.

Figure 7 represents the output after horizontal & vertical decomposition of cropped Classic breast cancer tumor picture.
Fig. 8. For Normal Patient Features Extracted Breast Cancer Tumor Picture.

Figure 8 shows the normal patient features extracted of mammogram picture.

Fig. 9. For Intermediate Stage Features Extracted Of Breast Cancer Tumor Picture.

Figure 9 shows the intermediate stage features extracted of mammogram picture.
Figure 10 shows the final stage features extracted of mammogram picture.

Figure 11 shows the segmented output mammogram picture.

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Figure 12 shows the detection of cancer of mammogram picture.

III. Conclusion

Breast cancer is mainly ordinary in poor anticipation & common disease. Therefore it is necessary to design the efficient breast cancer tumor detection method. In this paper a detection of breast cancer is present. In this a deep learning support vector technique (D-SVM) is utilized to distinguish the breast malignant growth tumor. The present calculation breaks down information and gives progressively precise outcomes.

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