IMPLEMENTATION OF BREAST CANCER PREDICTION USING ENHANCED CNN BASED IMAGE CLASSIFICATION MECHANSIM

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ABSTRACT: The main focus of this research is to perform Breast Cancer Classification. For this purpose the Convolution Neural Network has been used. However there are several researches in field of CNN based image classification for breast cancer but they have certain limitations. The major limitation of traditional research is that the graphical contents take a lot of space of storage device. Moreover there is need to reduce the comparison time. This research is going to improve the performance of CNN model using edge detection mechanism. During edge detection the useless portion of graphical content is removed. Thus the image size is reduced in order to minimize the comparison time. Proposed research is supposed to improve the performance of traditional CNN network.

KEYWORDS: Breast cancer classification, Convolution Neural Network, Edge detection mechanism, canny edge detection

[1] INTRODUCTION

Breast Cancer a different kind of cancer occurs when a cell divides over and over again in a process that runs out of control. There are two kinds of cancer Non-Invasive and Invasive .In the case of Non-Invasive Ducts fill with cancer cells (Ductal carcinoma In Situ).DCIS mostly occur in 50 - 60 years. There are five subtypes of ductal carcinoma in situ (1. comedo 2. solid 3. papillary 4. cribiform 5.micropapillary) while in Invasive (infiltrating) carcinoma cells break down through duct wall and came in stroma. Stroma is the fatty portion of breast. Cancer may spread from the lymph glands. After that it may spreads to other body's parts. Mostly it has been seen that breast cancer begins to ducts. It transfers the milk to the nipple from ducts. Such kind of cancer is referred as ductal cancer. On the other hand another kind of cancer begins in the glands. Glands make the breast milk. It is lobular cancer. There is rare breast cancer in men less than 1% among all the cancer. According to U.S. PSTF(U.S. preventive service task force), women who have age between 50 to 74 years must have mammography every two year. According to American Cancer Society women are of 40 to 44 years have to yearly mammography and women who are 45 to 54 years old have every year mammography.

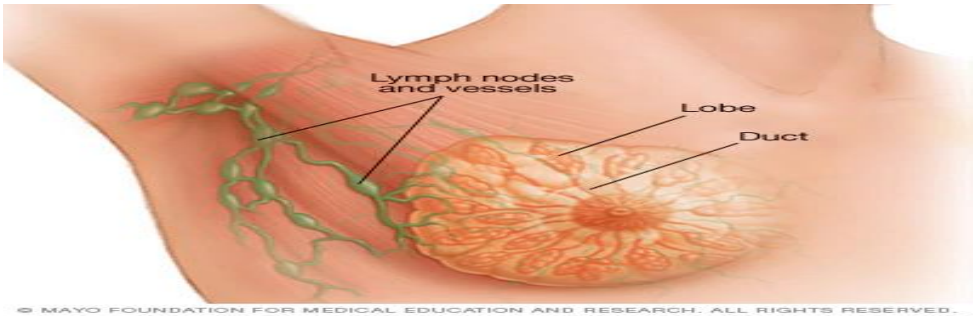

Fig 1: Breast cancer

Stages of breast cancer

There are different stages of breast cancer. These stages are differentiated with the use of T-N-M classification. T-primary tumour size, N-Lymph node involvement, M-Cancer spread beyond breast and lymph nodes. In stage 0 Cancer is confined to the duct in the breast. Stage I,II and III are based on tumour size and lymph node involvement. Stage IV is breast cancer that has spread to other parts of the body.

[2] BACKGROUND

There have been several researches that are using breast cancer detection. Such researches are beneficial to capture the symptoms of breast cancer in patient. Such type of research plays significant role in predicting the probability of breast cancer. Applications of CNN can be find in medical imaging since 1990s.

"Transferability" is set in pre-trained CNN. It is an important aspect of CNN. According to earlier research, in the field of medical imaging transfer learning is divided into two parts. First, to use pre-trained networks for feature extraction and in second group rest of pre-trained network has been applied as it is in first one except of logistic layer is used in place of fully connected layer. There are various type of data mining and machine learning algorithms used for breast cancer prediction like multilayer preceptor, SVM, logistic regression ,genetic algorithms, Fuzzy systems ,hybrid systems and CNNs etc. Thus in this research the proposal of using edge detection mechanism for improvement of the efficiency of traditional conventional neural network model is illustrated. More over there are limited research in field of graphical based breast cancer prediction model due to complexity in work. That's why the research focus on the CNN based graphical image processing for breast cancer prediction.

[3]ALGORITHMS USED FOR BREAST CANCER IMAGE CLASSIFICATION

There are various algorithms used for breast cancer image classification. In this research work we used CNN and Canny Edge Detection algorithm .

CNN (Convolutional Neural Network)

Convolutional neural network is known as **CNN due to the c**onvolutional layers exist in the system of **CNN**. Such layers are fundamentally applied to identify the traits on graphic. . Every neuron in Convolutional layer has been applied to get the traits of the close pattern of a graphic. In order to obtain same traits for the input graphic channels, weights of each neuron has been distributed between the nodes in the Convolutional layers. A deep Convolutional Neural Network has been trained to feed its input to the first layer. At final step the output is generated [3]. After the computation of the output, the error has been evaluated. At every phase in the model, parameters have been tuned for minimizing the error. Such procedures are continued with the information. The model is improved according to the procedure. To Train a Convolutional Neural Network has been known an iterative process. It includes the several layers. Input has been transferred to such layers. Along with these the parameter are also made according to the time. Three basic layers are there. Such layers have been applied to create the convolutional Neural Network system. The first is Convolutional layer whereas the second is fully integrated layer. Third is pooling layer. Regularly it has been seen that the fully Convolutional Neural Network system is created by putting the numerous of such layers one after another:

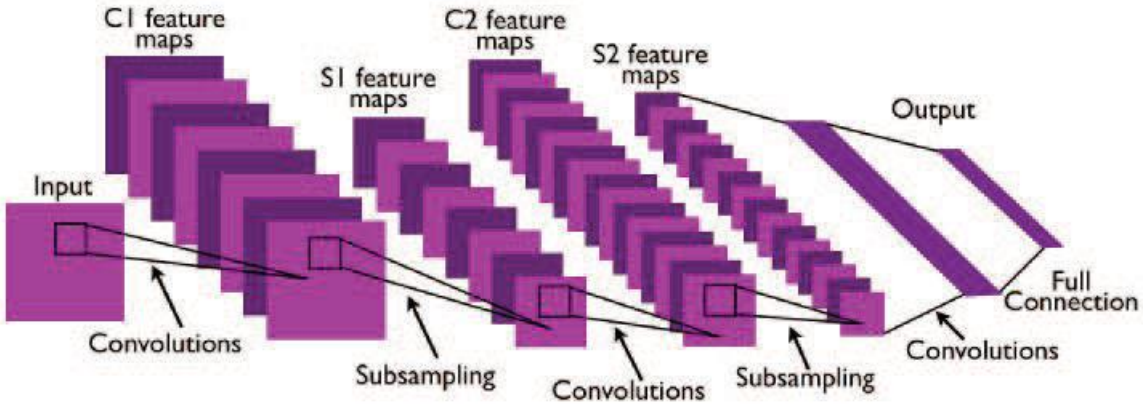

Fig 2: CNN architecture with two feature stages

CANNY EDGE DETECTION

John Canny introduced the mathematical challenge that derives an optimal smoothing filter. Here the localization, detection and minimizing several responses are considered. He has proposed that the optimal filter provided such suppositions are a computation of 4 terms related to exponential.

John Canny also presented that such filter is well approximated by first-order derivatives of Gaussians. He has also developed the notion of non-maximum suppression.

Canny Edge Detection Algorithm Flowchart

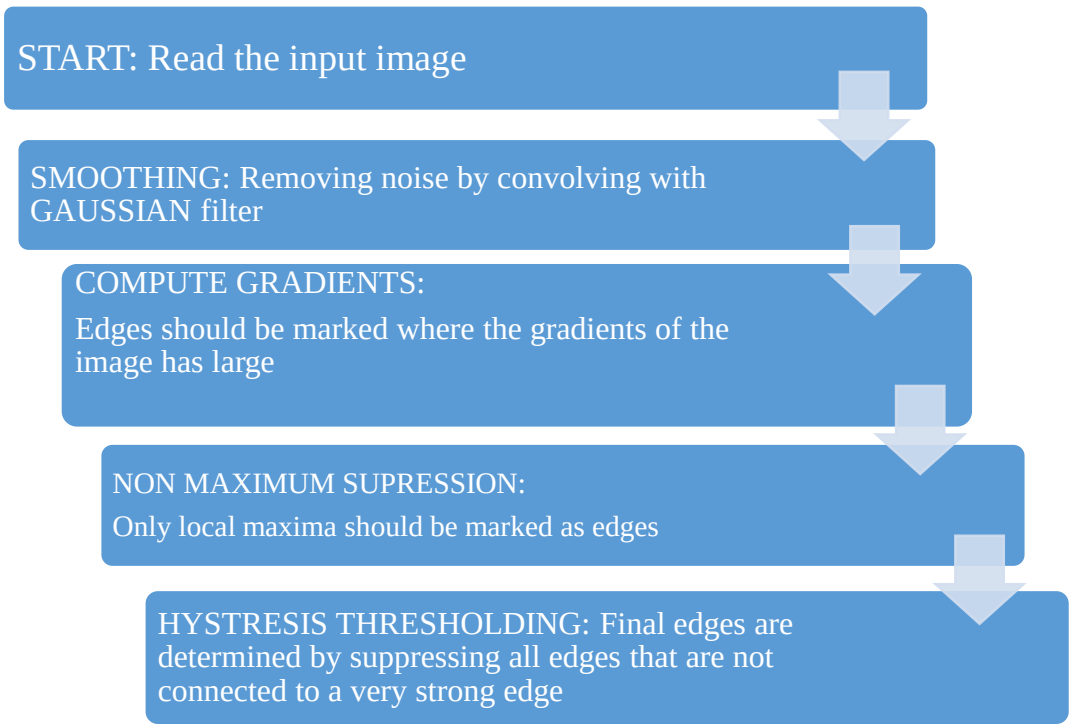

Fig 3.Canny Edge Detection

[4] LITERATURE REVIEW

There are several researches in the field of breast cancer in which some have been given below:

In 2017, Y. J. Tan, et al [1] proposed the research on breast cancer detection with the use of convolution neural networks for mammogram imaging system. In this paper, the goal of breast cancer detection using CNN (BCNN) is to speed up the diagnosis process.
In 2016, F. A. Spanhol et al [2] analyzed the Breast Cancer Histopathological Image categorization. The BreakHis dataset has been used in this research work. Every neuron in Convolutional layer has been applied to get the traits of the close pattern of a graphic. In order to obtain same traits for the input graphic channels, weights of each neuron has been distributed between the nodes in the Convolutional layers. A deep Convolutional Neural Network has been trained to feed its input to the first layer. At final step the output is generated [3].
In 2018, S. Charan, et al [3] evaluated the breast cancer detection in mammograms. In this research work the convolutional neural network has been used. The MIAS dataset is used in which abnormal c images were 133. Different filter size and pre-processing techniques have been applied. It has been done to neglect the noise element. Proper segmentation has been considered mandatory. It has been done to efficiently extract the feature and classify them.
In 2018, M. Nawaz, et al [6] proposed the multi-class breast cancer classification. In the research work the convolutional neural network has been used. The basic objective of this approach is to make classification of breast tumours.
In 2019, Y. Jiang, et al [7] discussed the breast cancer histopathological image categorization. The research work is proposing the design of a novel convolution neural network. They also used the small SE-ResNet module. A convolutional layer has been considered here, along with this the small SE-ResNet module are also determined here. As well as the third and final is also determined here which is fully connected layer. The research has proposed a small SE-ResNet module. It has been known as the growth of mixture of residual module
In 2019, D. A. Ragab, et al [8] explained the Breast cancer detection. In this research work the convolutional neural networks has been used for feature extraction and support vector device is used for classification. An innovative CAD system has been presented in the research work. They also used the segmentation concepts. The first concept includes the determination of the region of interest (ROI) basically.
In 2019, E. Kontopodis, et al [9] investigated the role of model-based biomarkers. They also considered the model- free graphical biomarkers. The results have suggested the model-free DCE-MRI IBs. Such are more robust alternative. These graphical biomarkers are very difficult.
In 2014, M. Thomas [10] proposed the prediction on breast cancer. In the research work they have used weighted clinical classifier. In the proposed model, the researcher has indicated a promising mathematical framework. They have discussed the fusion with non-linear categorization issues.
IN 2000, J. C. Tobias Christian Cahoon,[11] proposed on three-class mammogram categorization. Such categorization has been made on the base of descriptive CNN features. The researcher of this paper have discussed in the field of breast cancer.
In 2018, G. Czamota et al [12] discussed the Quantitative Ultrasound with Texture Predictors of Breast Tumour. They have analyzed the Quantitative Ultrasound Predictors. The limitation is that the proposed system is very slow.

LITERATURE REVIEW IN TABULAR FORM

SNO.	TITLE	AUTHOR/ YEAR	METHODOLOGY	ADVANTAGES	LIMITATION	TOOLS	SYSTEM SUBJECT
1	Breast Cancer detection with the CNNs for Mammogram Imaging architecture	Y. J. Tan, K. S. Sim, and F. F. Ting\2017	Convolution Neural Networks	To classify mammogram graphic into normal, benign and malignant	Lack of real implementation	The mammogram image	Detection of Breast Cancer
2	Breast Cancer Histopathological Image Classification using Convolutional Neural Networks	F. A. Spanhol and L. S. Oliveira\2016	CNN	To analyze the Breast Cancer Histopathological Image Classification	Need of more technical work	N/A	Breast Cancer Histopathological Image Classification
3	Breast Cancer Detection in Mammograms using Convolutional Neural Network	S. Charan, M. J. Khan, and K. Khurshid\2017	Convolutional Neural Network	Evaluate the breast cancer detection in mammograms	Limited scope of research	N/A	Detection of Breast Cancer in Mammograms
4	Breast Cancer Classification of Image using Convolutional Neural Network	A. Chandra and S. Rao\2018	Convolutional Neural Network	Discuss the Breast Cancer Classification of Image	Only propose the investigation	N/A	Classification of Breast Cancer of Image

5	Preparation of Papers for IEEE ACCESS	K. U. I. Liu, G. Kang, N. Zhang, and B. Hou\2018	Convolutional Neural Network	Explain the Preparation of Papers for IEEE ACCESS	Use only random forest algorithm	Wisconsin Diagnostic Breast Cancer database	Preparation of Papers for IEEE ACCESS
6	Multi-Class Breast Cancer Classification with the use of Deep Learning CNNs	M. Nawaz, A. A. Sewissy, and T. H. A. Soliman\2018	Deep Learning Convolutional Neural network	Propose the multi-class breast cancer classification	Limited scope of research	CNN model	Classification of Multi-Class Breast Cancer
7	Breast cancer histopathological image classification using convolutional neural networks with small SE-ResNet module	Y. Jiang, L. C. Id, H. Zhang, and X. Xiao\2019	Convolutional Neural Networks	Discuss the breast cancer histopathological image classification	Lack of technical work	Small SE-ResNet module.	Classification of Breast cancer histopathological images
8	Breast cancer detection using deep CNNs and support vector devices	D. A. Ragab, M. Sharkas, S. Marshall, and J. Ren\2019	Deep CNNs and Support Vector devices	Explain the Breast cancer detection	Requirement of more work	New-trained DCNN architecture	Consider the Breast cancer detection
9	Investigating the role of model-based and model-free imaging biomarkers as early predictors of neoadjuvant breast cancer therapy outcome	E. Kontopodis, M. Venianaki, G. Manikis, K. Nikiforaki, O. Salvetti, and E. Papadaki/2019	Imaging biomarkers	Investigate the role of model-based and model- free imaging biomarkers	Consider the limited challenges related to the breast cancer	Neoadjuvant chemotherapy	Breast cancer therapy
10	Predicting breast cancer using an expression values weighted clinical classifier	M. Thomas/2014	Weighted clinical classifier	Predict the breast cancer using an expression values	Did not resolve the issues related to data overalapping	LS-SVM classifiers	Breast cancer prediction using an expression values weighted clinical classifier
11	Three-class mammogram classification based on descriptive cnn features	J. C. Tobias Christian Cahoon, Melanie A.Sutton/2000	CNN	Discuss the three-class mammogram classification	Time consuming	Screening mammography classification	To describe the three-class mammogram classification
12	Quantitative Ultrasound and Texture Predictors of Breast Tumour Response to Chemotherapy	G. Czamota et al/2018	Quantitative techniques	Evaluate the Quantitative Ultrasound and Texture Predictors of Breast Tumour Response to Chemotherapy	Slow performance	Quantitative Ultrasound and Texture Predictors	To analyze the Quantitative Ultrasound and Texture Predictors

[5]PROBLEM STATEMENT

On the basis of literature review done by various researchers we find that SVM gives best result on textual data but CNN performs efficiently with graphical evaluations as well as the classification of the graphical data. Thus there is need to do more work on breast cancer prediction model considering the benefits of CNN. But the limitations of existing CNN model are the space consumption and comparison time. It takes lot of time during comparison of graphical content. Therefore the performance of traditional CNN model needs to be improved.

[6]CONCLUSION

Traditional researches have also found that SVM are suitable for textual data but CNN performs efficiently with graphical evaluations as well as the classification of the graphical data. **CNN** make use of layers that are fundamentally applied to identify the traits of a graphical data set of breast cancer related images. Thus in this research the edge detection mechanism has been discussed for improvement in efficiency of traditional conventional neural network model. Edge detection executes with the detection of irregularly in brightness. It has been applied for image segmentation as well as for data extraction. It has been used in graphic processing, computer vision as well as the machine vision. More over there are limited research in field of graphical based breast cancer prediction model due to complexity in work. That' s why the research focus on the CNN based graphical image processing for breast cancer prediction.

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