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Image Processing For Identification of Breast Cancer: A Literature Survey

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Abstract **-Breast cancer has become the leading cause of cancer deaths among women. To decrease the related mortality, disease must be treated as early as possible, but it is hard to detect and diagnose tumors at an early stage. Manual attempt have proven to be time consuming and inefficient in many cases. Hence there is a need for efficient methods that diagnoses the cancerous cell without human involvement with high accuracy. Mammography is a special case of CT scan who adopts X-ray method & uses the high resolution film so that it can detect well the tumors in the breast. This paper reviews on the detection of the breast cancer by image processing techniques.**
Keywords: **Breast Cancer, Image Processing, Segmentation, Pre-Processing, Mammogram, Machine Learning**

I. INTRODUCTION

The main cause of cancer death in women is due to Breast cancers. Early detection and diagnosis can be done through digital mammography preventing the death rate increase all around the world by identifying the disease in premature stages. Early diagnosis prevents the unwanted growth of malignant cells which saves the life of the patients. The abnormalities in the breast are of various types such as masses, micro calcifications, speculated lesions and architectural distortions. These abnormalities occur in two types called begin and malignant. The beginning is non-cancerous abnormalities whereas the malignant abnormalities are reported as cancers by the radiologist. The breast masses normally occurs in the dense regions with different shapes which includes shapes such as circumscribed, stellate, lobulated. They are difficult to detect because of the poor contrast, different sizes and shapes and the similarity to other breast muscles, blood vessels, fibrous tissues and breast parachymal. The micro calcification occurs in clusters and they are tiny granules of calcium deposits which usually occur in the size range 0.1 mm to 0.7 mm with irregular shapes.

The extraction of abnormalities from the digital mammograms is the main goal of image segmentation techniques. The segmentation methods consist of the breast regions segmentation and Regions of interest (ROI) segmentation. Segmenting the breast region suppresses the background of the image and separates the breast regions eliminating the surrounding areas which include the muscles, blood vessels, fibrous tissues and breast parenchymal. Segmentation of the regions of interest (ROI) is done by extracting the suspicious candidates which are targets of cancers by partitioning the image into non-overlapping regions ROI Segmentation is done on single view mammograms and multi view mammograms. The single view mammogram segmentation consists of the supervised and unsupervised methods which includes region. The multi view mammogram segmentation works on the images of the left and right breasts, multiple views of the same breast and similar views taken at different time intervals. The entire segmentation process also includes the regions with false positives which are eliminated in the classification stages.

II. RELATED WORKS ON DETECTION OF BREAST CANCER

The following table Irepresent the related works on the detection of the breast cancer using Image Processing technique and other soft computing, Machine Learning techniques.

TABLE I RELATED WORKS ON THE DETECTION OF BREAST CANCER

Author Name	Paper Title	Methods used	Description of the paper
ChiranjiLal Chowdhary, D. P. Acharjya [1]	A Hybrid Scheme for Breast Cancer Detection using Intuitionistic Fuzzy Rough Set Technique	Intuitionistic Fuzzy Set, Rough Set, Indiscernibility Relation, Restricted Equivalence Function.	In this paper, The hybrid scheme starts with imagesegmentation using intuitionistic fuzzy set to extract the zone of interest and then to enhance the edges surrounding it. The experimental analysis shows the overall accuracy of 98.3% and it is higher than the accuracy achieved by hybridizing fuzzy rough set model.
ShikhaAgrawal, JitendraAgrawal [2]	Neural Network Techniques for Cancer	Artificial Neural Network	Neural networks are currently a burning research area in medical science, especially in the areas of

	Prediction: A Survey		cardiology, radiology, oncology, urology and etc. In this paper, surveying various neural network technologies for classification of cancer
S. Punitha, S. Ravi and M. Anousouya Devi [3]	Breast Cancer Detection in Digital Mammograms using Segmentation Techniques	Segmentation and Edge Detection algorithms	Mammography is the most effective and reliable method for the early diagnosis of the breast cancers through screening and accurate detection of masses, microcalcifications and architectural distortions. The breast cancer detection accuracy and efficiency can be increased by applying various image analysis techniques on digital mammograms on the dense regions of the breasts helping the radiologists to identify suspicious regions preventing unwanted biopsies and traumatic treatments. This paper focuses on the various image analysis techniques such as segmentation and edge detection algorithms for the detection breast abnormalities and compares its advantages and disadvantages.
Monica, Singh Sanjay Kumar, AgrawalPrateek, MadaanVishu [4]	Breast Cancer Diagnosis using Digital Image Segmentation Techniques	Haar Wavelet Transform, Binarization, Segmentation, Artificial Neural Network	It is observed that the breast images are analyzed after decomposition. However, the image become smaller and crucial information may be lost by virtue of image decomposition and when region of interest is applied only on the specific segment of image as above said some information get lost. Further, the high pass decomposed image using wavelet transform over enhance the intensity variation that may be falsely detected and cancer characteristics leading to erroneous analysis. These limitations could be overcome by denoising the given input image using the wavelet transform and analysis made on inverse transformed image. The texture features should also be considered while analyzing an image for cancer detection. A back propagation neural network is trained using the mammogram images in different categories and tested using the sample as well as unknown images13 feature neurons are used for N/W training and testing as well. The N/W is trained for normal images as well as abnormal cases. The classification accuracy has been observed to the tune of 89%.
D. Selvathi and A. AarthyPoornila [5]	Breast Cancer Detection In Mammogram Images Using Deep Learning Technique	Unsupervised Deep Learning	The proposed system uses an unsupervised, deep learning based technique which uses Mammogram in the detection of breast cancer. The labelled data serves as the training set and the unlabelled images are classified with deep-learning nets. The deep network consists of stacked autoencoder and softmax classifier. The autoencoder has four hidden layers and a novel sparsityregularizer which incorporates both population sparsity and lifetime sparsity. The model is easy to apply and generalizes to many other scoring problems. The proposed model hasachieved an accuracy of up to 98.5% in classifying dense mammogram images.
M. Kanchana and P. Varalakshmi [6]	Breast Cancer Diagnosis Using Wavelet Based Threshold Method	Discrete Wavelet Transform, Probabilistic Neural Network.	In this paper initially, the mammography images are segmented using wavelet based threshold method. The proposed system provides valuable information to the radiologists and is helpful in detecting abnormalities faster than the traditional methods. The proposed Computer Aided Diagnosis (CAD) system is tested using Mammography Image Analysis Society (MIAS) database and achieves an accuracy of 92.3%
S.Kasthuri, J. Lilly Pushpam, K.Mahalakshmi, Viviyenmol M D [7]	Segmentation of Histopathological Images using Fast Fuzzy C-Means Approach	Fuzzy C Means Clustering	In this paper, a fast robust method for cell segmentation in histopathological images. The authors employee fast fuzzy c-mean algorithm. This method is stable and faster and we get more accurate segmentation and easy detection a cancer cell
Angshuman Paul and	Mitosis detection for	Morphological Scale	In this paper, the authors proposed a fast and accurate

Dipti Prasad Mukherjee [8]	Invasive Breast Cancer Grading in Histopathological Images	Space	approach for automatic mitosis detection from histopathological images. They employ area morphological scale space for cell segmentation. The scale space is constructed in a novel manner by restricting the scales with the maximization of relative-entropy between the cells and the background. This results in precise cell segmentation. The segmented cells are classified in mitotic and non-mitotic category using the random forest classifier. Experiments show at least 12% improvement in F_1 score on more than 450 histopathological images at 40× magnification
Pin Wang, Xianlling Hu, Yongming Li, Qianqian Liu and Xinjian Zhu [9]	Automatic cell nuclei segmentation and classification of breast cancer histopathology images	Wavelet decomposition, multi-scale region-growing, curvature scale space, adaptive mathematical morphology	In this paper, automatic QuantitativeimageanalysistechniqueofBCHimagesispr oposed.Forthenuclei segmentation, top bottom hat transform is applied to enhance image quality. Wavelet decomposition and multi-scale region growing (WDMR) are combined to obtain regions of interest (ROIs) there by realizing precise location. A double-strategy splitting model (DSSM) containing adaptive mathematical morphology and Curvature Scale Space(CSS) corner detection method is appliedtosplitoverlappedcellsforbetteraccuracyandrobu stness.Fortheclassificationof cell nuclei,4shape-based features and 138 textural features based on color spaces are extracted. Optimal feature set is obtained by support vector machine (SVM) with chain-like agent genetic algorithm (CAGA). The proposed method was tested on 68 BCH images containing more than 3600cells. Experimental results show that the mean segmentation sensitivity was 91.53% (74.05%) and specificity was 91.64% (74.07%). The classification performance of normal and malignant cell images can achieve 96.19% (70.31%) for accuracy, 99.05% (70.27%) for sensitivity and 93.33% (70.81%) for specificity
AnujKumar Singh and BhupendraGuptha [10]	A Novel approaches for breast cancer cells detection and segmentation in a mammogram cells	Max-Mean and Least-Variance technique	The authors introduce a simple and easy approach for detection of cancerous tissues in mammogram. Detection phase is followed by segmentation of the tumor region in a mammogram image. This approach uses simple image processing techniques such as averaging and thresholding. The authors introduce a Max-Mean and Least-Variance technique for tumor detection. Experimental results demonstrate the effectiveness of our approach.
Danilo Cesar Pereira, Rodrigo Pereria Ramos, Marcelo Zanchetta do Nascimento [11]	Segmentation and Detection of Breast Cancer cells in mammograms combining wavelet based analysis and genetic algorithm	multiple thresholding, wavelet transform, Genetic Algorithm, wiener filter	This paper presents a set of computational tools to aid segmentation and detection of mammograms that contained mass or masses in CC (cranio-caudal) and MLO (medio-lateral oblique) views. An artifact removal algorithm is first implemented followed by an image denoising and gray-level enhancement method based on wavelet transform and Wiener filter. Finally, a method for detection and segmentation of masses using multiple thresholding, wavelet transform and genetic algorithm is employed in mammograms which were randomly selected from the Digital Database for Screening Mammography (DDSM). The developed computer method was quantitatively evaluated using the area overlap metric (AOM). The mean ± standard deviation value of AOM for the proposed method was 79.2 ± 8%.The experiments demonstrate that the proposed method has a strong potential to be used as the basis for mammogram mass segmentation in CC and MLO views. Another important aspect is that the method overcomes the limitation of analyzing only CC and MLO views

HumayunIrshad, SepehrJalali, Ludovic Roux, Daniel Racoceanu, Lim JooHwee, Gilles Le naour, frederiquecapron [12]	Automated Mitosis Detection using texture, SIFT features and HMAX biologically inspired approaches	texture features combination,	This paper proposes an approach that assists pathologists in automated mitosis detection and counting. The proposed method, which is based on the most favorable texture features combination, examines the separability between different channels of color space. Blue‐ratio channel provides more discriminative information for mitosis detection in histopathological images. Co-occurrence features, runlength features, and Scaleinvariant feature transform (SIFT) features were extracted and used in the classification of mitosis. Finally, a classification is performed to put the candidate patch either in the mitosis class or in the no mitosis class. Three different classifiers have been evaluated: Decision tree, linear kernel Support Vector Machine (SVM), and non‐linear kernel SVM. They also evaluate the performance of the proposed framework using the modified biologically inspired model of HMAX and compare the results with other feature extraction methods such as dense SIFT. The proposed method has been tested on Mitosis detection in breast cancer histological images (MITOS) dataset provided for an International Conference on Pattern Recognition (ICPR) 2012 contest. The proposed framework achieved 76% recall, 75% precision and 76% F-measure
LuqmanMahood Mina, Nor Ashidhi Mat Isa [13]	A Fully Automated Breast Separation For Mammographic Images	Morphological Operations	The objective of this paper is to examine an algorithm of automated breast profile segmentation for mammographic images. The main contribution of proposed algorithm is applying the combined of thresholding technique and morphological preprocessing to segregate background region from the breast profile and remove radiopaque artifacts and labels. To show the validity of our segmentation system, it is extensively tested using over all mammographic images from the MIAS database. The MIAS database comprises 322 images with high intensity rectangular labels. Bright scanning artefacts were found to be present in majority of the database images. All square high intensity labels, apart from three were removed at a rate of 99.06%. The qualitative assessment of experimental results indicates that the method can accurately segment the breast region in a large range of digitised mammograms, covering all density classes
SemihErgin, OnurKilinc [14]	A new feature extraction framework based on wavelets for breast cancer diagnosis	Feature Extraction Framework	This paper investigates a pattern recognition framework in order to determine and classify breast cancer cases. Initially, a two-class separation study classifying normal and abnormal (cancerous) breast tissues is achieved. The Histogram of Oriented Gradients (HOG), Dense Scale Invariant Feature Transform (DSIFT), and Local Configuration Pattern (LCP) methods are used to extract the rotation- and scale-invariant features for all tissue patches. A classification is made utilizing Support Vector Machine (SVM), k-Nearest Neighborhood (k-NN), Decision Tree, and Fisher Linear Discriminant Analysis (FLDA) via 10-fold cross validation. Then, a three-class study (normal, benign, and malignant cancerous cases) is carried out using similar procedures in a two-class case; however, the attained classification accuracies are not sufficiently satisfied. Therefore, a new feature extraction framework is proposed. The feature vectors are again extracted with this new framework, and more satisfactory results are

			obtained. The new framework achieved a remarkable increase in recognition performance for the three-class study.
Any Estefany Ruiz Duque, Diana Carolina Arboleda Gómez, Jenny KateryneAristizábal Nieto [15]	Breast Lesions Detection in Digital Mammography:an Automated Pre-diagnosis	Split and Image technique	In order to enhance the efficiency and effectiveness of a diagnosis, an image analysis system was implemented; its purpose was to provide support for radiologists in detection of lesions from mammograms. Image segmentation techniques were carried out to find breast lesions within the mammograms in the region of interest (ROI), which is related to the area where breast density is concentrated. Breast density is defined as the brightest part on the mammographic image and it is composed by glandular and adipose tissue where breast lesions are likely to be exposed. This study provides a methodology divided in two main segmentation techniques: 1) a region growing technique and 2) split and merge technique. This study also gives a complete description of image analysis and the tools used in it
MichielKallenberg, Kersten Petersen, Mads Nielsen andrew Y. Ng, PengfeiDiao, Christian Igel, Celine M. Vachon, Katharina Holland, RikkeRassWinkel, NicoKarssemeijer and Martin Lillholm [16]	Unsupervised Deep Learning Applied to Breast Density Segmentation and Mammographic Risk Scoring	Breast Density Segmentation, Scoring of Mammographic Texture	This paper presents a method that learns a feature hierarchy from unlabeled data. When the learned features are used as the input to a simple classifier, two different tasks can be addressed: i) breast density segmentation, and ii) scoring of mammographic texture. The proposed model learns features at multiple scales. To control the models capacity a novel sparsityregularizer is introduced that incorporates both lifetime and population sparsity. They evaluated the method on three different clinical datasets. The state-of-the-art results show that the learned breast density scores have a very strong positive relationship with manual ones, and that the learned texture scores are predictive of breast cancer. The model is easy to apply and generalizes to many other segmentation and scoring problems
JasmeenKaur, MandeepKaur [17]	Automatic Cancer Detection in Mammographic Images	Pre-Processing Method, Filtering Operation, Segmentation, Fuzzy Logic, Skewness, Kurtosis, Mean and Standard Deviation	This paper has implemented a computer aided diagnosis system. The developed method proceeds in four steps: pre-processing mammograms for enhancement, segmentation to detect breast abnormalities, then texture feature(s) are extracted and finally image is classified
Seemasingh and Sushmita H [18]	An Efficient Neural network based system for diagnosis of Breast cancer	Back Propagation Neural Network algorithm	This paper proposes an automated technique using artificial neural networks as decision making tools in the field of breast cancer. The features extracted from biopsy slide images are used to train the neural network. Both supervised and unsupervised methods of neural networks are tested to develop the most efficient alternative for breast cancer diagnosis. Self-organization map (SOM) method under unsupervised techniques is used to classify the WDBC dataset into benign and malignant. Under supervised method, a variant of back propagation algorithm, scaled conjugate gradient is investigated for the same. The generalization capability of the network is improved using the Bayesian regularization technique
B.M.Gayathri , C.P.Sumathi and T.Santhanam [19]	Breast Cancer Diagnosis Using Machine Learning Algorithm –A Survey	Machine Learning Algorithms	A computerized breast cancer diagnosis has been developed to reduce the time taken to diagnose the breast cancer and reduce the death rate. This paper summarizes the survey on breast cancer diagnosis using various machine learning algorithms and methods, which are used to improve the accuracy of predicting cancer. This survey can also help us to know about number of papers that are implemented to diagnose the breast cancer.

Chandra PrasetyoUtomo, AanKardiana, Rika Yuliwulandari [20]	Breast Cancer Diagnosis using Artificial Neural Networks with Extreme Learning Techniques	extreme learning machine neural networks, BP ANN	In this paper, the authors implemented ANN with extreme learning techniques for diagnosing breast cancer based on Breast Cancer Wisconsin Dataset. Results showed that Extreme Learning Machine Neural Networks (ELM ANN) has better generalization classifier model than BP ANN. The development of this technique is promising as intelligent component in medical decision support systems
Minavathi, Murali.S, M.S.Dinesh [21]	Classification of Mass in Breast Ultrasound Images using Image Processing Techniques	Gaussian smoothing, anisotropic diffusion filters	In the proposed method, ultrasound images are preprocessed using Gaussian smoothing to remove additive noise and anisotropic diffusion filters to remove multiplicative noise (speckle noise). Active contour method has been used to extract a closed contour of filtered image which is the boundary of the spiculated mass. Spiculations which make breast mass unstructured or irregular are marked by measuring the angle of curvature of each pixel at the boundary of mass. To classify the breast mass as malignant or benign we have used: the structure of mass in accordance with spiculations, elliptical shape of the mass and acoustic shadowing feature which is an important functional feature. The paper have used receiver operating characteristic curve (ROC) to evaluate the performance. They have validated the proposed algorithm on 100 sub images (40 spiculated and 60 non spiculated) and results shows 92.7% of sensitivity with 0.88 Area Under Curve. Proposed techniques were compared and contrasted with the existing methods and result demonstrates that proposed algorithm has successfully detected and classified mass ROI candidates in breast ultrasound images.
R.Nithya, B.Santhi [22]	Comparative study on feature extraction method for breast cancer classification	intensity histogram, GLCM (grey level co-occurrence matrix) features based Neural Network	This paper presents an evaluation and comparison of the performance of three different feature extraction methods for classification of normal and abnormal patterns in mammogram. Three different feature extraction methods used here are intensity histogram, GLCM (Grey Level Co-occurrence Matrix) and intensity based features. A supervised classifier system based on neural network is used. The performance of the each feature extraction method is evaluated on Digital Database for Screening Mammography (DDSM) breast cancer database. The experimental results suggest that GLCM method outperformed the other two methods
Ashmithakhaleel khan &noufal p [23]	Wavelet based automatic lesion detection using improved active contour method	Mean Filter, Adaptive Mean filter, Weier Filter	In this paper, the authors have proposed a new method-Improved Otsu method that helps in the segmentation process for lesion detection. In this method before segmentation preprocessing and DWT of image in done. Preprocessing is one of the most important stages in medical images to remove the unwanted noise and for the enhancement of image. Discrete Wavelet Transform is considered for segmentation as it contains most significant information of the input image
Chethan k, Dr. Krishna A N [24]	Detection of breast masses in digital mammograms using multiple concentric layers	multiple concentric layers, mammogram Segmentation	The work in this paper focuses on the automatic detection of masses in digital mammograms, The proposedsystem consists of two main stages; the first stage is the breastsegmentation to remove the background and labels, The secondstage is to determine the masses region, The proposed method utilizes the correlation between a typical mass region and the mammogram image in Order to determine and extract the suspicious region in the tested image, The system is developed and evaluated with mammogram

			images from the mammographic image analysis society (MlAS) Dataset. The results show that the proposed algorithm has a sensitivity of 89,30% fOl' mass detection, and the classification accuracy rate each 94,66%
Nalini Singh, Ambarish G Mohapatra [25]	Breast Cancer Mass Detection in Mammograms using K-means and Fuzzy C-means Clustering	Watershed Image Segmentation, K-Means clustering, Fuzzy C- Means Clustering	This study that shows the outcome of applying image processing threshold, edge based and watershed segmentation on mammogram breast cancer image and also presents a case study between them based on time consuming and simplicity. The real-time implementation of this paper can be implemented using data acquisition hardware and software interface with the mammography systems.
LotheSavita A., Dr. DeshmukhPrapti D [26]	A survey of Image Processing techniques for Detection of Mass	RBFNN, k-nearest neighbors, PCNN	This paper gives a survey of image processing techniques for detecting mass from mammogram images
AmitChaudhary, TarunGulati [27]	Segmenting Digital Images Using Edge Detection	2-D spatial gradiant	In this paper, the two most commonly used edge detection methods (Laplacian and Sobel edge detectors) are discussed. It is found that Sobel edge detection algorithms perform better than Laplacian algorithms; however, the false edges are high in both cases for blurred or low resolution images. Therefore, a new algorithm and set of filters (kernels) is proposed and its results are compared with the Sobel and Laplacian filters for three images. From the results obtained it is found that the proposed algorithm performs better than in terms of less false edges than the Sobel and Laplacian filters
ShanmugaVadivu and Sivakumar [28]	Wavelet Transformation-Based Detection of Masses in Digital Mammograms	Wavelet Transformation	A Novel Wavelet Transformation-Based Detection of Masses in digital mammograms (WTBDM) is proposed in this paper that enables for the early prognosis of breast cancer. The wavelet analysis is explored for analyzing and identifying strong variations in intensities within the mammographic data which highlights and recognizes the masses effectively. The proposed algorithm, in addition to wavelet transformation, uses morphological preprocessing, region properties and seeded region growing to remove the digitization noises, to remove the pectoral muscle and to suppress radiopaque artifacts, thus segmenting the abnormal masses accurately. The combined potential of wavelet and region growing helps for effective mass segmentation that vouches the merit of the proposed technique
PitchumaniAngayarkanni and NadiraBanu Kamal [29]	Mathematical Morphological Approach Mammogram Image Segmentation and Classification	Morphological and Rough Set approach	This paper presents the mathematical morphological and rough set based approach in detection and classification of cancerous masses in MRI mammogram images. The main objective behind this approach is tobuild a CAD system with good accuracy and computational speed in detection of cancerous masses compared to the existing system. The ROI(Region of Interest) is segmented using Graph cut method and the fourteen features including morphological, shape and novel features are calculated for this region. Best rules used for classification are generated using ID3 algorithm. Automatic classifications based on the rules generated are determined using Artificial bee colony based Multi Layered Perceptron model. The sensitivity, the specificity, positive prediction value and negative prediction value of the proposed algorithm accounts to 98.79%, 98.8%, 92% and 96.6% which rates very high when compared to the existing algorithms. The area under the ROC curve is 0.89. A GUI based tool was developed for the proposed methodology. An android

			application using simulator was developed to make the doctor and patient to view the image with appropriate information like Patient Name, age, Size of tumor, Nature of tumor and type of treatment.
Monica Jenefer and Cyrilraj [30]	An Efficient Image Processing Methods for Mammogram Breast Cancer Detection	Watershed Algorithm	In this paper it is discussed about a tumor segmentation and classificationalgorithm from mammogram. The proposed approach concentrates on the result of two issues. One is the way to recognize tumors as suspicious regions may be very weak contrast to the background and the next is the way to concentrate properties which classify tumors. The proposed technique follows step by step procedures such as (a) Image Enhancement (b) Tumor Segmentation. (c) The extraction of properties from the segmented tumor region. (d) The utilization of SVM classifier. The improvement could be characterized as change of the image originality to a superior and more reasonable level. The mammogram enhancement can be obtained by removing the noise and improve the quality of the image using speckle noise removal and EM algorithm respectively. The most well-known division technique utilized is Modified Watershed Segmentation method. The features are extracted from the segmented tumor region and classify the regions utilizing the SVM classifier. The technique was tried on 100 mammographic images using MIAS and Apollo hospital based images. The system attained an Accuracy of 98%
Sutton and Bezdek [31]	Breast Cancer Detection Using Image Processing Techniques	Windows mean and standard deviation	This paper describes the use of segmentation with fuzzy models and classification by the crisp k-nearest neighbor (k-nn) algorithm for assisting breast cancer detection in digital mammograms. This research utilizes images from the digital database for screening mammography. It shows that supervised and unsupervised methods of segmentation, such as k-nn and fuzzy c-means, in digital mammograms will have high misclassification rates when only intensity is used as the discriminating feature. Adding window means and standard deviations to the feature suite (visually) improves segmentation produced by the k-nn rule. While this results are encouraging, other methods are needed to detect smaller pathologies such as microcalcifications
K.Akila, P.Sumathy [32]	Early Breast Cancer Tumor Detection on Mammogram Images	Segmentation, Edge Detection, Canny Edge Detection, Median Filter, Thresholding	This proposed work discusses about the breast cancer detection at the earlier stage on mammogram images using k-means algorithm. This approach has been done in three steps. The primary step is pre-processing, which removes noises in the images. Then canny edge detection is used to detect the edges of images. After finding the edges morphological operation is done to get clear mass. Then original image overlapped with the erode image to get clear view of tumor. K-means algorithm is used to classify the tumor level based on the count of pixel values in the mammogram images. Further the level of the tumor has been analyzed and classified. In this proposed work identifies tumor level based on the pixel count as well as it also detects the tumor in the earlier stage itself.
PratishthaShrivastava and Kirar [33]	Detection of Tumor in mammogram images using Canny Edge Detection Technique	Canny Edge Detection	In this paper, the work proposed is based on the following procedure: (a) Removing the background information (b) Applying the edge detection technique and retrieving the largest ROI (c)After getting the close loops, filling is performed in order to highlight the tumor (d) Performing the morphological operations whichare erosion and dilation. This method was tested

			over multiple images and implemented using matlabcode
NavjotKarur, Dr. Sanjay Singla [34]	A Review on Detection of Breast Cancer using Mammography	SVM Classifier, GLCM Feature Extraction,	In the proposed work, it have applied all techniques to expose begin and malignant cancer. It has taken DDSM/MIAS database images and then apply pre-processing technique and image enhancement technique. Image segmentation technique is applied to segment the images. Lastly SVM classifier is used to classify begin and malignant cancer. In this proposed work, GLCM features are also extracted. They are Contrast, Correlation, Energy and Homogeneity.
Amandeep Singh, Amanpreetkaur [35]	Breast tumour detection using segmentation technique from CT scan	Crop Segmentation, Noise Reduction, Edge Detection, Global Thresholding	This paper presents image processing technique to detect tissue information, biomedical images have the ability to assist physicians in detecting disease caused by cells abnormal growth. Developing algorithms and software to analyze these images may also assist physicians in their daily work. The key and hardest task is auto-extracting of tiny modules or tumour from the biomedical image, which if detected at initial stage gives the information of early cancer. This study combines image threshold, edge detection and segmentation helps in detection of cancer

III. CONCLUSION

This paper presented a survey and analysis on the classical approaches of the image processing techniques used in Digital Mammography. The technique described in paper includes all the segmentation detection algorithms for both single view and multi view mammograms and these techniques suitable for breast region segmentation and ROI segmentation.

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