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Breast Cancer Detection by Using Matlab

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ABSTRACT: Breast cancer is the most common type of cancer in women and the second leading cause of cancer death in women after the lung cancer. The development of breast cancer involves several types of genetic code in order to promote the cancer. The subsequent steps in gene alterations with respect to tumor development are not clear, and the process is far less understood. Nowadays there are many techniques used for identification of breast cancer. This paper presents the image processing technique by using the ResNet (Residual Network) deep learning algorithm for identification of breast cancer using mammography images. It gives details about steps carried out while identifying the breast cancer and also provides the information about the various ResNet (Residual Network) deep learning algorithm functions used in those steps. This method helps the physician in breast cancer diagnosis and monitor the treatment process.

KEYWORDS: Breast Cancer, Image Processing, Mammography, Machine Learning.

I. INTRODUCTION

Breast cancer is the most frequent type of cancer observed in females in the whole world with a lifetime risk. Which makes most of the world wide organizations and countries to put an effort in early discovery of breast cancers. The early discovery of cancer can improve the rate of treatment to be successful and to make the patient live normally. Research of the molecular events relating to breast cancer biology has greatly increased over the last decade. The development of breast cancer depends on various factors such as breast density, health history, age, age at first childbirth, breastfeeding, consumption of alcohol, exercise etc. Some factors affect in a large amount and some in small amount. Some factors such as being women or getting older can't be changed and the factors such as leading healthy lifestyle can help us to lower the risk of breast cancer. Breast cancer usually starts when cancer cells form in breast tissue and becomes invasive when cells begin to grow out of control. During this various symptoms can be observed such as lump in breast, bloody discharge from nipples, changes in size, shape and color of breast. Keeping up with regular breast self-exams and mammograms can help to identify breast cancer. Breast cancer occurs in women and men too. It's important to understand that all breast tumors are not cancerous. Non-cancerous breast tumors are observed due to abnormal growth of cells, but they do not spread outside of the breast. But it is important to be checked by a healthcare professional for early discovery of cancer, as it can help the patient live normally.[3,5]. From the last few decades multiple studies have shown that mammographic screening can reduce the rate of breast cancer. Even though many efforts have been taken, breast cancer is still the most common cancer and the leading cause of cancer-related deaths in women across the world. There are many other methods available for diagnosis such as ultrasound, Magnetic Resonance Imaging (MRI), thermography etc. but mammographic screening still remains the most commonly used in the world. Therefore, accurate reading of mammograms is important for the effective screening of mammographs. Breast includes the various characteristics such as mass with specific site, texture, border and shape, all these characteristics can be easily studied under the image processing technique by using the MATLAB. MATLAB is a high performance programming language for technical computing which integrates computation, visualization and programming. Most of the time while processing the image input image is a low quality image MATLAB helps to improve the image quality by providing the functions for enhancing and removing the noise in the image. For applying these functions first it converts the image into digital format then processes on image. Then these preprocessed images can be used for further processing. The raw mammographic image is first converted to gray-scale image then the converted image is enhanced to increase the intensity of pixel and filtered to reduce the noise in the first stage called pre-processing of image. Then the pre-processed image is passed through binary filter and edge detection for identifying the boundaries of the image and for separating the background pixels under the process called segmentation. Then segmented image is passed through standard deviation filter for edge sharpening and then through feature extraction for extracting the Region Of Interest (ROI) by applying threshold value.



II.EXISTING SYSTEM

Image acquisition step involves the and its connection to the computer or processors. Computer or processors will receive the image in digital format. Image pre-processing step is a step to improve and enhance the image for processing step. Image processing step is a further step in analysing the image to obtain desired object. A lot of image processing techniques can be used in this step such as morphological processing, edge detection and compression. Feature extraction is where a set of desired features extracted from data pixels of the image which are good for classification. Object classification and classification decision are steps to make decision based on test and analysis.

III.PROPOSED SYSTEM

The image processing is used to change the nature of an image to improve and enhance the image for human interpretation. Image processing also used to render image for machine perception. In his module, he explains on how to use matrix capabilities of ResNet(Residual Network) deep learning algorithm to investigate images and its properties. The image processing ResNet (Residual Network) deep learning algorithm operations are explained in term of chapters. Image display chapter explain on how to use imshow function to display image and how spatial resolution and quantization affect the display and appearance of the image. Another chapter explain on point processing and the sub-chapter are arithmetic operation, histogram and thresholding. This sub-chapter discuss on how to modify image (enhance and blurring image) using ResNet algorithm function that show how each operation work. For example, imadjust function which indicate histogram stretching is use to enhance image. The next chapter teach about spatial filtering. This chapter is also explaining on how to enhance and blurring image but using different operation. The operation discuss in this chapter is by filtering image using frequencies (low and high pass filter), Gaussian filter and non-linear filter.

Advantages

- Classification between „Fatty breast“ and „Glandular breast“.
- Detection for abnormalities in type „Fatty breast“ images.
- Detection of high temperature in thermal images.
- Houghpeaks function will locate peaks in the Hough transform matrix and this value will be used to crop the ROI.

IV.IMPLEMENTATION

MATLAB is a programming language developed by Math Works. It started out as a matrix programming language where linear algebra programming was simple. It can be run both under interactive sessions and as a batch job. This tutorial gives you aggressively a gentle introduction of MATLAB programming language. It is designed to give students fluency in MATLAB programming language. Problem-based MATLAB examples have been given in simple and easy way to make your learning fast and effective.

MATLAB (matrix laboratory) is a fourth-generation high-level programming language and interactive environment for numerical computation, visualization and programming.

MATLAB is used in every facet of computational mathematics. Following are some commonly used mathematical calculations where it is used most commonly –

- Dealing with Matrices and Arrays
- 2-D and 3-D Plotting and graphics
- Linear Algebra
- Algebraic Equations
- Non-linear Functions
- Statistics
- Data Analysis
- Calculus and Differential Equations
- Numerical Calculations
- Integration
- Transforms
- Curve Fitting
- Various other special functions

Features of MATLAB



Following are the basic features of MATLAB –

- It is a high-level language for numerical computation, visualization and application development.
- It also provides an interactive environment for iterative exploration, design and problem solving.
- It provides vast library of mathematical functions for linear algebra, statistics, Fourier analysis, filtering, optimization, numerical integration and solving ordinary differential equations.
- It provides built-in graphics for visualizing data and tools for creating custom plots.
- MATLAB's programming interface gives development tools for improving code quality maintainability and maximizing performance.
- It provides tools for building applications with custom graphical interfaces.
- It provides functions for integrating MATLAB based algorithms with external applications and languages such as C, Java, .NET and Microsoft Excel.

Uses of MATLAB

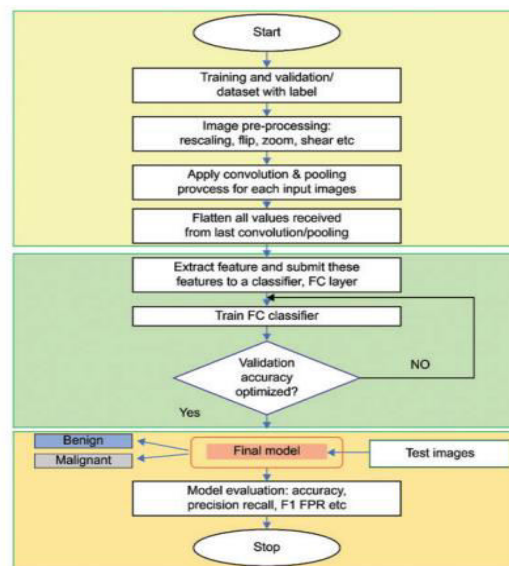
MATLAB is widely used as a computational tool in science and engineering encompassing the fields of physics, chemistry, math and all engineering streams. It is used in a range of applications including –

- Signal Processing and Communications
- Image and Video Processing
- Control Systems
- Test and Measurement
- Computational Finance
- Computational Biology

INPUT DESIGN

Breast Cancer Dataset In this study, we have used a BreakHis open dataset, which contains different breast cancer classes in two main categories, benign and malignant. A total of 7,909 images of 40x, 100x, 200x and 400x magnification levels were obtained from 82 patients. Out of these, 2,480 belonged to the benign and 5,429 to the malignant class. Each image has been represented by an 8-bit RGB channel, with the size of 700 × 460 pixels. Total number of images, based on different magnification levels, are summarised in the Table 2.

SYSTEM ARCHITECTURE



V. MODULES DESCRIPTION

PRE-PROCESSING OF MAMMOGRAPHIC IMAGES

The purpose of the pre-processing step is to produce data which are compatible with the breast cancer region detection and classification system. Input image is grey image and resize operation performed to get specific size image for further operation.



FEATURE EXTRACTION

Feature extraction described in the form of features dataset produced after loading training database, feature evaluation, and analysis conducted following loading the experiment training database. The process of transforming raw data into numerical features that can be processed while preserving the information in the original data set.

CLASSIFICATION

Classification is mainly based on features extracted from training dataset. To classify accurately training dataset should be proper and perfect. Mammographic views of cancer patient and normal patients collected from local hospital.

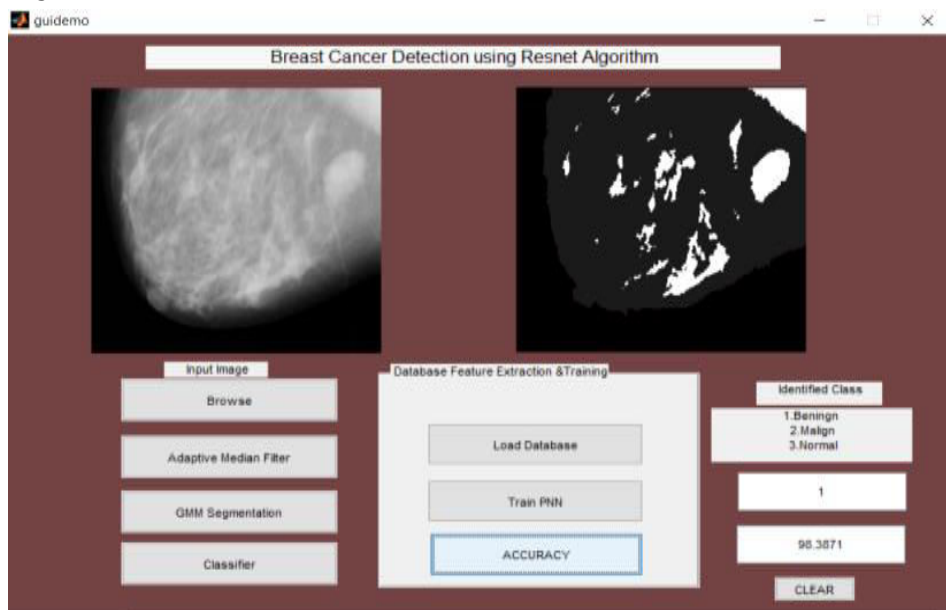
MARKER CONTROLLED WATERSHED SEGMENTATION

Marker-controlled watershed segmentation follows this basic procedure Compute a segmentation function. This is an image whose dark regions are the objects you are trying to segment. These are connected blobs of pixels within each of the objects. The watershed transforms find “Catchment basins” and “watershed ridge lines” in an image by treating it as a surface where light pixels are high and dark pixels are low.

TEXTURE SEGMENTATION USING TEXTURE FILTERS

Texture segmentation is the process of partitioning an image into regions with different textures containing similar group of pixels. entropy for creating texture images. Entropy is standard function that return an array value in which each output pixel contains the entropy value of the 9x9 pixel around the corresponding pixel in the input image.

ACCURACY



VII.CONCLUSION

- This focuses on processing mammography images using ResNet (Residual Network) deep learning functions. The pre-processing techniques removes the unwanted noise and enhance the quality of the image by applying various filtering techniques.
- Binary filter and edge detection identifies the boundaries of the image and separates the background pixels under the segmentation.
- Then segmented image is passed through standard deviation filter for edge sharpening and then through feature extraction for extracting the Region of Interest (ROI) by applying threshold value.
- The resulting images gathered from this process can be helpful for physician in breast cancer diagnosis and monitor the treatment process



VI.FUTURE ENHANCEMENT

- In the future, advances in sensors, contrast agents, molecular methods, and artificial intelligence will help detect cancer-specific signals in real time. To reduce the burden of cancer on society, risk-based detection and prevention needs to be cost effective and widely accessible.
- AI-based systems can help pathologists in diagnosing cancer more accurately and consistently, reducing the case error rates. Predictive-AI models can estimate the likelihood for a person to get cancer by identifying the risk factors. The situation in India is equally grim with the number of people suffering from cancer being projected to increase to 29.8 million in 2025 from around 27 million this year.
- Cancer is a relatively democratic disease impacting people of all ethnicities, sexual identities and economic backgrounds.

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