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Performance Analysis of Cancer Disease Diagnosis using Classification Technique

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Abstract: *In the human body, there are several types of tissues formed by a plurality of cells. The inharmonious and vertiginous growth of these cells can cause a tumor, being able to be benign or malignant thus originating the cancer. Many researchers proposed many solutions and challenges of different phases of computer aided system to detect the lung cancer in early stages and give the facts about the lung cancer, breast cancer and other types of cancer. Breast cancer is the type of cancer that affects women more; however, there is a small possibility of occurring in men, even in a very unusual way, since according to statistics, for every 1 man diagnosed with cancer 100 women present the disease. Breast cancer accounts for more than 1 in 10 new cancer diagnosis each year and is the leading cause of cancer death in women. Cancer detection and diagnosis is one of the most important areas of research in medical field. Neural networks have been used for medical sciences by many researchers, for different classes of cancer. In this paper we present the feed forward neural network classifier for the breast cancer detection and improved the accuracy rate over the previous approach.*

Keywords: Health care, Accuracy, Support vector machines, Classification techniques, Multi layer neural network.

Introduction

Image processing is an area under of a computer science research to process digital images through an algorithm or method. Image processing may be a method to perform some operations on a picture, so as to urge an enhanced image or to extract some useful information from it. It's a kind of signal processing during which input is a picture and output could also be image or characteristics/features related to that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computing disciplines too.

There are two sorts of methods used for image processing namely, analog and digital image processing. Analog image processing is often used for the hard copies like printouts and pictures. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that each one sorts of data need to undergo while using digital technique are pre-processing, enhancement, and display, information extraction. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing.

Analog image processing is done with photographic film. Color films have chemical components that cause the amount of silver developed on one layer to change the amount of silver developed in other layers. There are intra-layer effects that enhance sharpness also and inter-layer effects that enhance color reproduction. There are certain effects designed into the formulation of the film. There are a few darkroom wizards left out who can accomplish Photoshop like edits with masking film and with retouching techniques.

The advantage of digital is that the manipulation is often done much faster. You can adjust slide bars to urge the effect you would like. It is possible to adjust the contrast of a color image using masking film sandwiched with the original film, but it takes hours for each step. There is a premium on getting it right the first time. Digital editing processes allow one to make mistakes and correct them quickly. It also allows automatic algorithms to do complex edits.

The breast is formed from different tissue, starting from very adipose tissue to very dense tissue. Within this tissue may be a network of lobes. Each lobe is formed from tiny, tube-like structures called lobules that contain milk glands. Tiny ducts connect the glands, lobules, and lobes, carrying milk from the lobes to the nipple. The nipple is found within the middle of the areola, which is the darker area that surrounds the nipple. Blood and lymph vessels also run throughout the breast. Blood nourishes the cells. The lymph system drains bodily waste products. The lymph vessels hook up with lymph nodes, the tiny, bean-shaped organs that help fight infection.

Cancer begins when healthy cells within the breast change and grow out of control, forming a mass or sheet of cells called a tumor. A tumor are often cancerous or benign. A cancerous tumor is malignant, meaning it can grow and spread to other parts of the body. A benign tumour means the tumor can grow but won't spread. Breast cancer spreads when the cancer grows into other parts of the body or when carcinoma cells move to other parts of the body through the blood vessels and/or lymph vessels. this is often called a metastasis. Although carcinoma most ordinarily spreads to nearby lymph nodes, it also can spread further through the body to areas like the bones, lungs, liver, and brain. This is often called metastatic or stage IV carcinoma. Learn more about metastatic carcinoma during a separate section on this website. If carcinoma comes back after initial treatment, it can recur locally, meaning within the breast and/or regional lymph nodes. The regional lymph nodes are those nearby the breast, like the lymph nodes under the arm. It also can recur elsewhere within the body, called a foreign recurrence or metastatic recurrence.

Breast cancer is the commonest explanation for cancer death in women. Consistent with the latest statistics, it's estimated that 40,610 women within the India have died in 2019 due Breast Cancer. As of March 2019, there are quite 3.1 million women with a history of carcinoma within the India. Mammography is one among the foremost widely used methods for carcinoma screening and has contributed significantly to the reduction of the death rate through early detection of cancer. However, the complexity of mammograms (MGs) and therefore the high volume of exams per radiologist may result in false diagnosis. Computer-aided detection (CAD), which employs image processing techniques and pattern recognition theory, has been introduced to supply an objective view to radiologists. Studies have shown the effectiveness of CAD models; however, accurate detection of carcinoma has remained challenging. Recent studies show that CAD models cannot improve significantly the diagnostic accuracy of mammography. The most important challenge in using CAD for abnormality detection in MGs is that the high false positive rates (FPR). False positives end in patient anxiety, additional radiation exposure, unnecessary biopsies, high callback rates, increased health care costs, and additional assessment. Within the India, many women undergo screening mammography annually, as a result, even a

little reduction within the FPR end in a widespread benefit. The restrictions of current CAD indicate the necessity for brand spanking new, more precise detection methods. Recent advances in computational technologies, significant progress in machine learning and image processing techniques, and prevalence of digital MG images have opened an opportunity to affect the challenging issue of early detection of carcinoma using deep learning (DL) methods. Recently, DL methods, especially convolution neural networks (CNNs, also mentioned as ConvNets) have gained many attentions to CAD for MGs as they assist overcome CAD systems' limitations. CNNs achieve higher detection accuracy than CAD models, and help radio logists provide more accurate diagnosis by delivering quantitative qualitative analysis of suspicious lesions. A recent research study shows that using DL methods drop human error rate for carcinoma diagnoses by 85%. Current CNN models are designed to enhance radiologists' ability to seek out even the littlest breast cancers at their earliest stages alerting the radiologist to the necessity for further analysis. Recent studies used CNNs to get a typical description of lesions, which may help radiologist in making a more accurate decision. Moreover, advances in CNNs can't only aid radiologists, but also eventually make diagnosis systems to read MGs independently within the near future. With in the previous couple of years, CNNs have led to breakthroughs during a sort of pattern recognition and classification problems for natural images thanks to the supply of massive data repositories, fast graphical processing units, and therefore the power of parallel and distributed computing. Training a deep CNN model with a limited number of medical data is extremely challenging, which has been addressed by using transfer learning (TL) and augmentation techniques. Studies show that CNN methods that compare images from left and right breasts and also the cranio caudal (CC) and medio lateral-oblique (MLO) view of each breast can improve the accuracy of detection and reduce the false positives. CNNs have also been utilized in the danger assessment applications to extend the accuracy of early detection carcinoma by radiologist.

II. Classification Techniques

Classification is a technique to categorize observations based on a training set of data. Classification predicts some value of a categorical variable, i.e., class of the observation, based on categorical and/or numerical variables, i.e., features. In medical image mammograms, classification is used to predict the type of mass based on the extracted set of features. Classification algorithms can be grouped into four main groups according to their ways of calculations: frequency table based, covariance matrix based, similarity functions based, and others.

Classification may be a technique to categorize observations supported a training set of knowledge. Classification predicts some value of a categorical variable, i.e., class of the observation, supported categorical and/or numerical variables, i.e., features. In medical image mammograms, classification is employed to predict the sort of mass supported the extracted set of features. Classification algorithms are often grouped into four main groups consistent with their ways of calculations: frequency table based, covariance matrix based, similarity functions based, et al. ZeroR classifier is that the simplest sort of frequency table classifiers that ignores the features and does classification based on the category only. +e class of any observation is usually the class of the bulk . ZeroR classifier is usually used as a baseline for benchmarking with other classifiers. OneR classifier algorithm is another sort of frequency table classifier. It generates a classification rule for every feature supported the frequency then selects the feature that has the minimum classification error. +is method is simple to construct and its accuracy is usually comparable to the more sophisticated classifiers with the advantage of easier results interpretation .

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Naıve Bayesian (NB) classifier is additionally a frequency classifier based on Bayes' theorem with a robust independence assumption between the features. NB classifier is particularly useful for giant datasets. Its performance sometimes outperforms the performance of the more sophisticated classifiers as discussed in [20]. Unlike ZeroR classifier that does not use any features within the prediction and OneR classifier that uses just one feature, the NB classifier uses all the features within the prediction.

III. Result Analysis

Breast cancer is the most common type of cancer and the leading cause of death for female cancer patients; 15% - 25% of women around the world are diagnosed with breast cancer during the lifetime. Breast cancer has several symptoms, but it may not be noticed until the late stage. Therefore, it's critical to consider regular inspection through a safe diagnostic tool. Once the suspicion of breast cancer is confirmed, the staging and the grades are important factors to assist doctors in deciding the appropriate treatment. In this section we proposed a comparative model for the breast cancer detection using the image processing and classification techniques. The mining of healthcare database is very critical issue. The healthcare data stored the information about medical diseases and patient's information. For the estimation of patients and disease used some intelligent software for the predication of disease. The prediction of disease and medicine is fundamental issue in health care environment. For the extraction of better information used data mining technique for the healthcare system.

A computer assisted diagnosis model can be used to provide additional information and support the decision making on disease diagnosis and cancer staging. It is different from a computer-aided detection model which aims to detect, localize, or segment suspicious regions. However, it should be noticed that a computer-aided detection model can be placed ahead of a diagnosis model for comprehensive analysis from the detection and localization to the diagnosis of suspicious regions. Widely used features come from image descriptors that quantify the intensity, shape, and texture of a suspicious region. Preferred machine learning classifiers are not limited to artificial neural network (ANN), support vector machine (SVM), k-nearest neighbors, naive Bayesian, and random forest (RF). The study include Computer Assisted Diagnosis (CAD), in which a WSI can be mapped to a certain disease. Also, detection of ROI, cancer staging can be performed by CAD. Another application is retrieval of similar images to a query image, or searching for images from a large database.

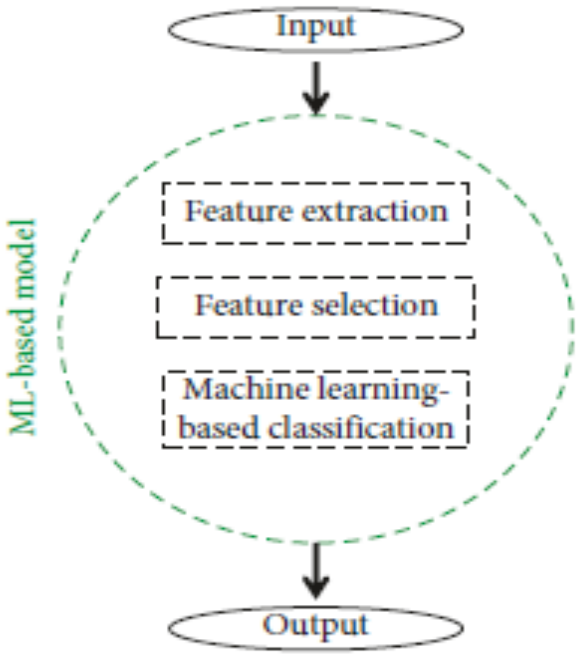

Fig. 1: The above figure represent the machine learning based image classification.

In this section, experimental process of we show that the comparative result analysis study for the detection of breast cancer using classification techniques. The mining of healthcare database is very critical issue. The healthcare data stored the information about medical diseases and patient's information. For the estimation of patients and

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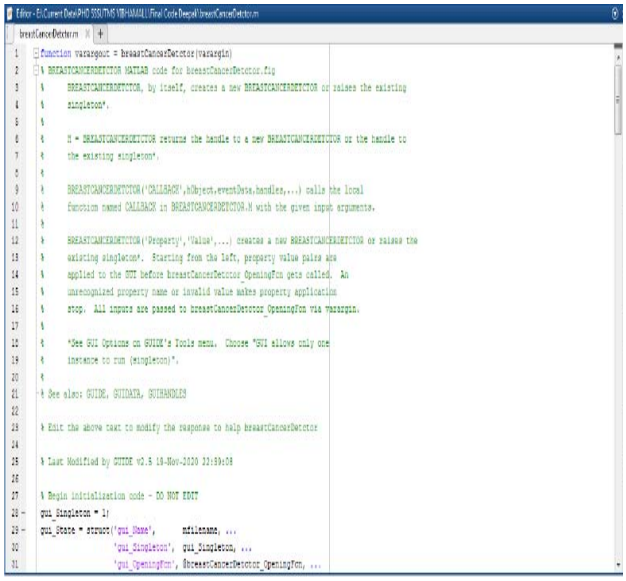

Fig. 2: This image shows that the code environment window for the experimental work.

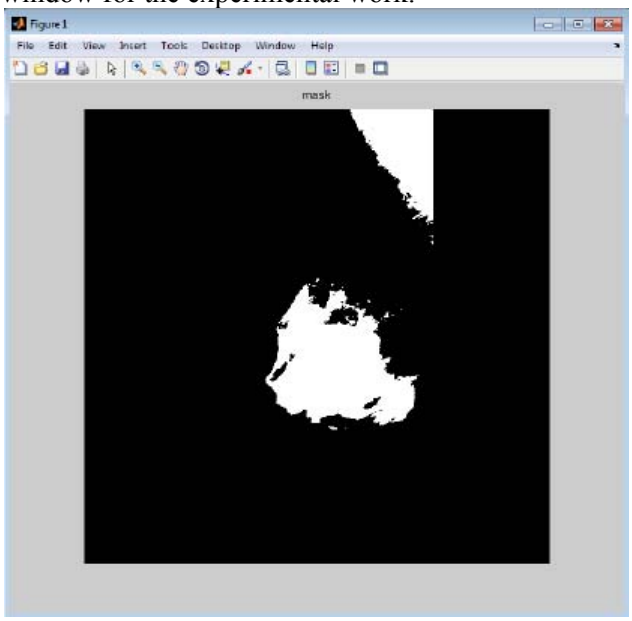

Fig. 3: This image shows that the mask image for the experimental work.

IV. Conclusion

Cancer is a term used for a group of disorders associated with abnormal cell growth. The abnormal cells have the potential to spread to other parts of the body (metastasis). Cancer can develop in any part of the body; the most common types are prostate, lung and bronchus, breast and colorectal. Cancer is staged according to its extent at the time of diagnosis. Cancers originating in epithelial tissues are called carcinomas. Here we present the comparative performance for the breast cancer diagnosis using the support vector and feed forward neural network techniques, and our simulated results shows the feed forward neural network gives the better accuracy than the support vector machines, In future we also used some optimization techniques for the improvement in performance and also reduce the computation time in near future.

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