Machine Learning Research on Breast and Lung Cancer Detection

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Abstract: *As the diagnosis of these cancer cells at late stages causes greater pain and raises the likelihood of death, the initial-state cancer finding is crucial to giving the patient the proper care and reducing the risk of dying from cancer. The publication offers a chance to research breast and lung cancer detection techniques as well as various algorithms for cancer early detection. With the aid of various image kinds and test results data sets, hybrid approaches are utilized to identify lung and breast cancer based on the size and form of the cells. The basic concept of breast and lung cancer block diagram is also explained in this study, with an emphasis on the difficulties and potential future applications of cancer detection and diagnosis techniques.*

Keywords: Mammogram, Breast, Lung, Cancer, Diagnosis

I. INTRODUCTION

Cancer is a complicated illness that results from the unchecked division of aberrant cells in some parts of the body, making it responsible for a number of illnesses [1,2]. Therefore, early detection of cancer is challenging due to the small size of cancer cells [3]. Numerous studies on the identification and classification of cancer cells have been published [4]. For instance, the Random Forest algorithm, Bayesian methods, Support Vector Machines, some unsupervised and semi-supervised techniques favored by Logic-Based classifiers, comparative analysis of different image PDE (Partial Differential Equations) based segmentation, and other techniques to analyses breast images[5,6,7,8,9,10,11]. Finding a novel, reliable approach to diagnose cancer at an earlier stage is crucial [12,13]. Researchers have a fantastic opportunity to segregate and categorize the cancer cells utilising deep learning-based convolution neural network approaches because big imaging datasets are readily available[14,15,43]. Our main focus will be on creating a convolution neural network-based method for classifying and segmenting breast and lung cancer cells [16,17].

II. RELATED WORKS

The left-censored Cox proportional hazards model was used in paper [18] to examine the effect of mammography on breast cancer mortality. K-medoid clustering is utilized in paper [19] to obtain breast cancer data in a syndrome cluster in order to assess an analysis. Neural networks and association rule mining for breast cancer were key components of study [20]. A new hybrid Grey Wolf Optimizer technique, integrating decision trees and other applied techniques like C4. S PSOC4. S, was given in Paper [21]. A classifier based on non-convex LP-norm minimization and SoC was presented in Paper [22]. (Sum of Coefficient). Machine learning is a useful method in paper [23] by looking into somatic mutations to suggest cancer sites. In paper [24], the hybrid analysis method is applied to investigate the problem related to breast cancer using decision trees and clustering. A learning method known as multiple clustered instances learning was devised in article [25] to gather the units in histopathological images. In paper [26], interpretate MRI breast pictures, accuracy of cancer symptom detection, and CAD system are highly helpful concepts to consider. Edge detection and PDE (partial differential equation) based segmentation algorithms are used in study [27] for the identification of lung cancer. The segmentation and classification algorithms were assessed in study [28], which combined patch-level classification with a deep learning idea. If lung cancer is suspected, the person will undergo a

number of screening tests before being examined for the existence of malignant tumour cells. Physicians recommend using medical imaging tools to identify lung cancer. Imaging tools aid in spotting suspicious areas, teaching about cancer stages, approving therapies, and watching for any indications that cancer cells may be coming back [29]. Cell segmentation can be seen as creating an accurate zone of cells nearby in an image when used in the programmed diagnosis of cancer, where identifying cells is the first but most important step. Automated cell segmentation is seen as a significant barrier in the pipeline of automated histopathological image analysis and is still a major area of research. Detection of ancient cells paired with cell segmentation [30] [31]. A pre-processing stage analysis revealed that CT is one of the less expensive ways to find lung cancer. Medical CT pictures are appropriate for adaptive and filter median. [32].

III. MODELS AND METHODS

We are aware that if cancer is discovered at an early stage, the likelihood of survival dramatically rises for the majority of patient groups. Many lives have been saved by current screening programmes for colorectal, breast, and cervical cancer, but they are not sensitive enough. Research is necessary to improve our biological comprehension of early malignancies, to improve our capacity to recognize them, and to investigate the technologies employed [33]. Several places are actively conducting high-caliber research with an emphasis on cancer early detection. Lung cancer is a fatal illness. There are numerous different sizes and shapes of cancer cells [34]. Early detection of it is challenging.

Bayesian methods, Logic-Based classifiers, Support Vector Machines, for instance the Random Forest algorithm, and a few other unsupervised, semi-supervised methods used for breast image classification are used to detect cancer cells in a microscopic image [35,36]. Tumor Marker Test, Complete Blood Count, and image into multiple regions are also important to detect cancer cells in a microscopic image. Marker Controlled, Watershed Segmentation, Edge Identification, and PDE based segmentation techniques are compared to other image segmentation methods for the detection of lung cancer [37]. Establishing a novel, reliable approach to assess cancer, the tissues contained in the input mammography images of breast cancer, and the input CT image of the lungs is crucial.

3.1 Pre-processing of Images

The median filter will be applied to lung cancer CT scan images at the pre-processing stage for adaptive contrast enhancement. The AHE has the ability to enhance local contrast and enhance the details in the image [38]. In order to increase contrast in mammography pictures of breast cancer, contrast-restricted adaptive histogram equalization, a kind of AHE, will be applied.

3.2 Designing of Model to Identify the Presence of Lung Cancer

Using a convolution neural network and chest CT images, the suggested method can identify lung cancer. The CT image's lung areas are first removed, and each slice in those regions is segmented to look for malignancies. The CNN architecture is trained using the segmented tumour regions. The patient photos are then tested using CNN. Fig. 1 depicts the suggested model. The trained system will be able to identify the presence of cancer in the CT scan of the lung.
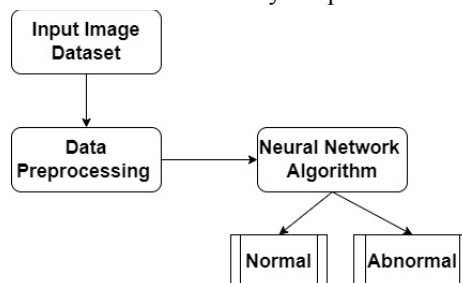

Figure 1: Block schematic of the suggested lung cancer model

3.3 Design of Model to Identify the Presence of Breast Cancer

The suggested method for using Deep Convolution Neural Network to detect breast cancer based on mammography images is shown in Figure 2. After image improvement, a picture will be divided into sections with like characteristics

using image segmentation. In the first method, the Region of interest pooling is started using circular contours. The second strategy, which combines the threshold and region-based approaches, will be used to resolve the region of interest pooling. Deep CNN will be used to classify the Region of interest pooling [39,40].
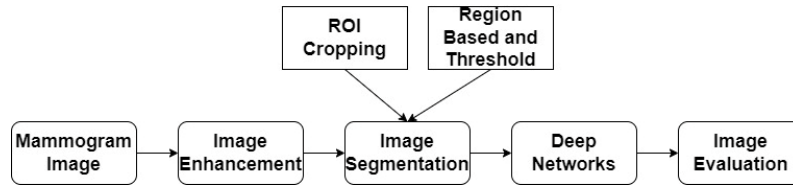

Figure 2. Block schematic of the suggested breast cancer model

A classifier's performance is assessed using evaluation tools such the F1 score, the confusion matrix, the accuracy, and the receiver-operating curve's area under the curve [41,42]. It employed a confusion matrix to precisely display the classifier's performance on a table. Additionally, a detected result for an image region is implicit and can be either correct or erroneous. The same five classifiers that were employed in this study's voting procedures. Each model has a coefficient (weight) that is typically inversely related to how accurate it is in classifying data. Due to the fact that they can still influence the ultimate decision, this only partially resolves the issue of subpar models.

IV. CONCLUSION

In the research, we provide a thorough assessment of the available machine learning-based diagnostic techniques for early identification of breast and lung cancer, which can help patients, receive better care. A variety of models based on voting have been widely utilized in machine learning to predict cancer. The deep-learning multimodal technique is effective for detecting cancer. Additionally, we must create cutting-edge instruments with great sensitivity and specificity for the detection of cancer.

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DOI: 10.48175/IJARSCT-9016

ISSN
2581-9429
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