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# COMPUTER AIDED DETECTION AND DIAGNOSIS OF BREAST CANCER IN MAMMOGRAMS USING DEEP LEARNING APPROACHES

## ABSTRACT


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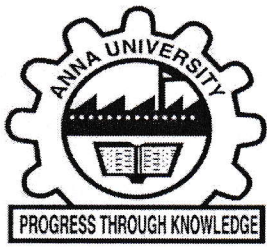



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# ABSTRACT

An average of 25 percent of women diagnosed with cancer are affected with breast cancer. The only way to recover from the effects of this disease is to diagnose it as soon as possible. Radiologists diagnose the disease through mammograms. The two main abnormal signs seen on a mammogram are masses and micro-calcification. Identifying these signs accurately is a challenging task as there is only a subtle difference between these tissues when inspected through mammograms. Failure to detect these signs could endanger the patient's life. If any abnormalities are spotted in the image, they are further examined using biopsy. As biopsy is painful, the patient should be subjected to this procedure only after carefully examining the symptoms. An average review of mammograms will take several hours due to the complexity of the task.

The medical field is greatly benefitted by computer technology. The task of the radiologist can be simplified with the help of a computer. With its assistance, one can easily detect abnormal regions and also assess its severity. The field of machine learning is highly useful, as it acquires intelligence from the data. Neural networks are a class of machine learning algorithms used for capturing non-linear relationship between the input and the output. These algorithms are providing astonishing performance for tasks involving natural images. This research work aims at improving the diagnosis of breast cancer using neural network-based algorithms.

Medical images are of greater resolution compared to natural images. Processing these images using neural networks is computationally infeasible due to memory constraints in the Graphical Processing Unit. Either the image has to be resized without loss of information (or) it should be

analysed in patches. Patch based processing results in large number of false positive detections, which affects the diagnostic process. In this research, multi scale processing is used with resized images to facilitate detection of smaller lesions. The other biggest challenge in medical image analysis is the limited availability of data. Neural network suffers from problem of overfitting when smaller dataset is used. In this research, two popular model architectures namely convolutional neural networks and capsule networks are used for detection and diagnosis of abnormalities in a mammogram. To address the problem of limited dataset, generalization approaches are explored. Novel modifications in the architecture and the training process are used to effectively train the models on a limited dataset.

A unified approach BrCAD is proposed with novel architectures for mass segmentation, microcalcification detection and abnormality classification. These models are trained and tested using CBIS-DDSM dataset. To assist the radiologist in screening large number of mammogram images, Deep MSMIL is proposed. It processes the images at multiple scales to determine the abnormality and also localizes the lesions using visualization techniques. This model was trained and tested on INBREAST dataset and a private dataset which contains both normal and abnormal images.

The proposed system can be used in remote areas with poor medical facilities. As a future work, the tissues in contralateral breast can be used in the detection. This can improve the quality of detections in denser breasts.