IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

A Review Paper on Brief Study on Breast Cancer Classification using Deep Learning

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Abstract: *The biggest cause of cancer-related deaths among women is breast cancer. The greatest and most efficient method to slow the growth of a tumour is early detection and diagnosis. The currently advised imaging technique for the early detection and diagnosis of breast cancer is mammography. Mammogram mass classifications continue to be a major difficulty and are essential for helping radiologists make an accurate diagnosis. The precise detection and classification of breast cancer is a crucial task in medical imaging because of the complexity of breast tissues. Due to their ability to automatically extract characteristics, deep learning techniques have been successfully applied in a wide range of industries, but particularly in the field of medical imaging. In order to identify and classify breast cancer on histopathology images, this research suggests an unique patch-based deep learning technique called Pa-DBN-BC (DBN). To extract features, unsupervised pre-training and supervised fine-tuning phases are performed. The network automatically extracts features from picture patches. To categorise the patches from histopathology images, logistic regression is performed. The model receives the characteristics extracted from the patches as input, and it outputs a probability matrix with either a positive sample (cancer) or a negative sample (background).*

Keywords: Deep Learning.

I. INTRODUCTION

One in eight women will develop breast cancer during their lives. Breast cancer is the most frequent type of cancer and the second leading cause of mortality for women after lung cancer. Any breast tissue, cell, or gland has the potential to become cancerous. It can start in the ducts that produce milk or in the glandular tissues known as lobules, which produce milk. If cancer cells are not found at an early stage, there is a potential that they will damage other areas of the body and spread. Breast tumours can either be benign or malignant; benign lesions are non-cancerous cell abnormalities that cannot develop into breast cancer, whereas malignant lesions are cancerous lesions. It is quite difficult to manually evaluate the microscopic image because both benign and malignant cells contain erratic features and architectures. Malignant cells proliferate swiftly by starting divisions right away. Breast biopsies and mammography, often known as low-dose x-rays of the breast, are two the most frequent type of cancer and the second leading cause of mortality for women after lung cancer. Any breast tissue, cell, or gland has the potential to become cancerous. It can start in the ducts that produce milk or in the glandular tissues known as lobules, which produce milk. If cancer cells are not found at an early stage, there is a potential that they will damage other areas of the body and spread. Breast tumours can either be benign or malignant; benign lesions are non-cancerous cell abnormalities that cannot develop into breast cancer, whereas malignant lesions are cancerous lesions. It is quite difficult to manually evaluate the microscopic image because both benign and malignant cells contain erratic features and architectures. Malignant cells proliferate swiftly by starting divisions right away. Breast biopsies and mammography, often known as low-dose x-rays of the breast, are two frequently used methods for finding breast cancer. Radiologists use a certain kind of breast picture during mammography to find early signs of breast cancer. With the aid of DBN, the suggested framework offers the automatic and precise representation of features from photos. Patch-based DBN requires fewer hardware resources, making it superior to other deep learning techniques.

II. LITERATURE SURVEY

[1] Li et al. proposed a patches' selection technique established by clustering ML algorithm and deep learning CNN (Convolutional Neural Network) to choose additional Selective patches. The method projected on four classes that are

used for the classification of BC (breast cancer) using images and the highest achieved 95% accuracy on the main test set and 88.89% accuracy on the complete test set. The outcomes are reasonably associated with the outcomes of extra state-of-the-art systems.

[2] Essam H. Houssein, Marwa M. Emam, Abdelmgeid A. Ali Proposed An optimized deep learning architecture for breast cancer diagnosis based on improved marine predators algorithm. Breast cancer detection and classification in the early phases of development may allow for optimal therapy. Convolutional neural networks (CNNs) have enhanced tumor detection and classification efficiency in medical imaging compared to traditional approaches.

[3] Irum Hirra, Mubashir Ahmad,Proposed Breast Cancer Classification From Histopathological Images Using Patch-Based Deep Learning Modeling. This study proposed a Bayesian networks to classify the mammographic images with each view and then used logistic regression for the final decisions on the results generated by Bayesian networks. s. CAD systems are bound to analyze each mammographic view separately while the radiologists have to analyze two views at a time to find the difference by comparison.

[4]. M. A. S. Al Husaini et al Proposed a Systematic Review of Breast Cancer Detection Using Thermography and Neural Networks. This paper reviews systematically the related works employing thermography with AI highlighting their contributions and drawbacks and proposing open issues for research. Several different types of Artificial Neural Networks (ANNs) and deep learning models were used in the literature to process thermographic images of breast cancer, such as Radial Basis Function Network (RBFN), K-Nearest Neighbors (KNN), Probability Neural Network (PNN), Support Vector Machine (SVM), ResNet50, SeResNet50, V Net, Bayes Net, Convolutional Neural Networks (CNN), Convolutional and DeConvolutional Neural Networks (C-DCNN), VGG-16, Hybrid (ResNet-50 and V-Net), ResNet101, DenseNet and InceptionV3.

[5] Cuong Vo-Le, Nguyen Hong Son, Pham Van Muoi and Nguyen Hoai Phuong Proposed a Breast Cancer Detection from Histopathological Biopsy Images Using Transfer Learning. In this paper, a dataset named VBCan is introduced, which is composed of images of hematoxylin and eosin (H&E) stained lymph node sections. The dataset has 3529 images at resolution of 512x512. Then, a two-stage method is introduced to evaluate the accuracy of the breast cancer detection, i.e. a combination of feature extraction by one of state-of-the-art CNNs namely VGG-16, GoogLeNet or ResNet-50 and various conventional machine learning classifiers.

[6] Md. Omaer Faruq Goni, Md. Habibur Rahaman, Oishi Jyoti Proposed a Breast Cancer Detection using Deep Neural Network. This study has suggested a deep neural network with feature selection techniques to predict breast cancer. The appraisal of the suggested strategy is performed on different evaluation benchmarks like train accuracy, test accuracy, precision, recall, specificity, sensitivity, f measure and MCC. There are frequent researches on breast cancer diagnosis based on modern technologies such as machine learning, fuzzy system, genetic algorithm.

[7] Jurgen Schmidhuber, Alessandro Giusti, Dan C. CireSan, and Luca M. Gambardella successfully proposed a model which helped in detection of the series of mitosis in breast cancer using advanced deep neural networks for detecting mitosis they have used maximum pooling convolution neural network. The neural networks were capable enough to classify each and every pixel in the image, followed by simple post processing the neural output. In past years, computerized tool were considered to play an essential role in diagnosis of breast cancer.

[8] M. A. Nasser matching strategy is done to identify the relationship in candidate positions in multiple mammographic views SIFT is adopted to find candidate points. M. A. Berber introduced a feature extraction method for a dangerous mammogram and its class. 7 features for GLCM offered. It also introduced three composite classifications named Wavelet-CT1, Wavele-CT2 and ST-GLCM. SVM is used for classification. Specificity, sensitivity and accuracy for GLCM is 96.88%, 98.43% and 97.91%. F. This paper presents the method to detect cancer region and classify normal and cancerous patient. Pre-processing operation perform on the input Mammogram image and undesirable part removed from the image, tumor region segmented from the image using morphological operation and highlighted the region on original mammogram image or if mammogram image is normal case then it shows that patient is normal.

[9] Research on breast cancer detection using digital image processing is not new but many new approaches in this field is being considered to accurately predict the tumor region. The present approach is to detect the tumor region visually as well as to figure out in which region the tumor is mostly concentrated.

[10] AmirEhsan Lashkari, Fatemeh Pak, Mohammad Firouzmand, have clarified the automatic technique which has been presented to help physicians in early detection of breast cancer based on various parameters. It also classifies and labeling

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procedures, supervised learning techniques such as AdaBoost, support vector machine, nearest neighbor, Naïve Bayes and probability neural network analysis.

III. FUTURE SCOPE

In the future, our model may operate more efficiently and accurately if more hardware resources, such as a GPU, were made available to allow for the use of a large number of input patches. Additionally, this study is a binary classification study since we only distinguish between the regions associated with cancer and the background regions in this work. Using these models, we can work on categorising various cancer kinds in the future.

IV. CONCLUSION

In this paper, a Pa-DBN-BC model for categorising breast cancer based on histopathological images is given. By producing equal-sized patches of photos, the suggested model automatically learns the features. Pre-training is completed unsupervised, and fine-tuning is completed under supervision. The patch matching model is used to construct a probability estimate matrix after learning the features. The findings demonstrate that the deep learning approach increased the classification precision for breast cancer cases.

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