# A Deep Learning Based Breast Cancer Detection Algorithm with Feature Fusion Techniques

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***Abstract*** **-** Cancer has been portrayed as a heterogeneous disease comprising of a wide range of subtypes. The early diagnosis of a cancer type is very important to determine the course of medical treatment required by the patient. The significance of classification cancerous cells into benign or malignant has driven many research studies, in the biomedical and the bioinformatics field. In the past years researchers have been encouraged to use different machine learning (ML) techniques for cancer detection, as well as prediction of survivability and recurrence. Machine learning with image processing can be used to distinguish key highlights from complex datasets and uncover their significance. The predictive models talks about here depend on different administered ML strategies and on various input features and data samples. We have used genetic algorithm and feature fusion to make the algorithm more efficient. The hybrid algorithm to detect the type of breast cancer (benign or malignant) and selection of features which are more relevant for prediction. We have made a comparative study to find out the best algorithm of the above, for prediction of cancer type. With a high level of accuracy, any of these methods can be used to predict the type of breast cancer of any particular patient.

## I. INTRODUCTION

A breast cancer is diseases in which cells in the breast grow out of control. There is different king of breast cancers like invasive lobular carcinoma an invasive ductal carcinoma. The kind of breast cancer depends on which cells in the breast turn in cancer. It mainly affects women, but in rare causes men get breast cancer too. One in seven women in the UK will developed breast cancer in the life time. Around, 55000 women and 370 men are diagnosed breast cancer every in the UK. Around, a further 7000 people are diagnosed with ductal carcinoma in situ. Breast cancer occurs mainly older women, over the age of fifty and in men it happens at the edge over sixty.

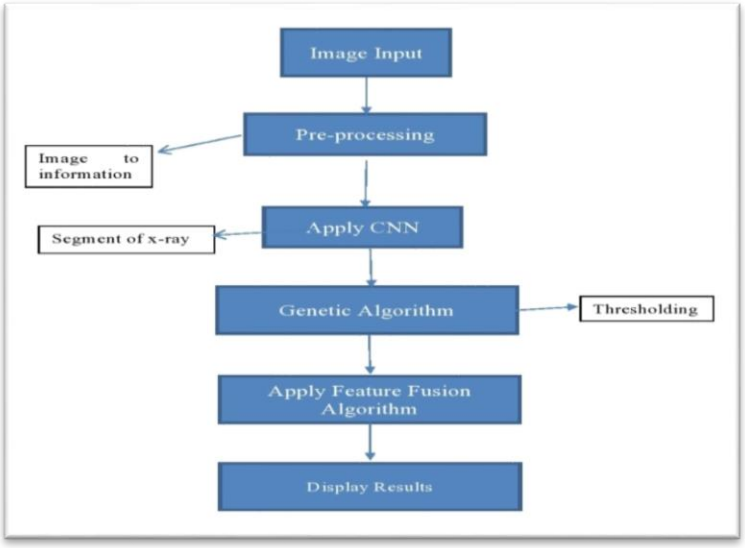
Breast cancer detects in earlier stage then we can save the life of the patients. It is frequent diagnosis diseases among women. It can detect by medical breast examination, yet the detection rate very low. And also, abnormal areas that cannot have to be quite facing to use this traditional technique but it can easily see on a mammogram. Mammogram is currently the best method for detecting breast cancer at early stage [1]. Mammography images are complex. Thus, image processing and features extraction technique are used to assist radiologist to detect tumour. Detecting cancer, it can be quite challenging. Because, cancer is not a single disease but there is a collection of multiple diseases. Every disease is separated from every other cancer exits. Also, their drug has different reaction on similar type of cancer.

## II. PROBLEM STATEMENT

Multilevel image thresholding is a time consuming process. When it comes to cancer images, many researches have been done on the diagnosis and detection of breast cancer using various image processing and classification techniques. Nonetheless, the disease remains as one of the deadliest disease. The process that follows to detect cancerous tumour in early stage can be one of the step to prevent the life risk. previous researches has used image processing techniques like image segmentation with population based meta heuristic algorithm including whale optimization algorithm , grey wolf optimizer, cuckoo optimization algorithm, bio-geography based optimization, teaching-learning based optimizations , gravitational search algorithm, imperialist competitive algorithm, cuckoo search. Which are furthermore time consuming and can lead to content specific results? Using one or two advanced algorithms with artificial intelligence can solve the purpose of efficient results with less time consumption during process.

## III. SYSTEM DESIGN

Fig.1: Modules of Proposed System



Following are the modules of a system

- After CNN, This hybrid model (feature fusion with GA) will first find feature of image using traditional methods.
- Here, weight of each feature will be initialized randomly.
- The feature and weight is combined as key value combination and out of them can make the facial- classification accuracy as the highest.
- The optimization is achieved by Genetic Algorithm.
- Here, the key problem was to build the combination of vectors and weights.
- We will all focus image feature extraction used kernels training.
- Genetic Algorithm is comparatively faster and self-adaptive algorithm.

This paper explores a machine learning based on feature fusion with convolutional neural network (CNN) deep features. Here, we create a feature fusion technique with a mass detection method based on CNN deep features and unsupervised extreme learning machine clustering. We build a feature set using deep features and texture features based on detected features.

**A. Image Input**

In this paper, Data from the UCI Machine Learning repository will be used. This dataset contains 201 instances of one class and 85 instance of another class. The instances are described by 9 attributes, some of which are linear and some are nominal.

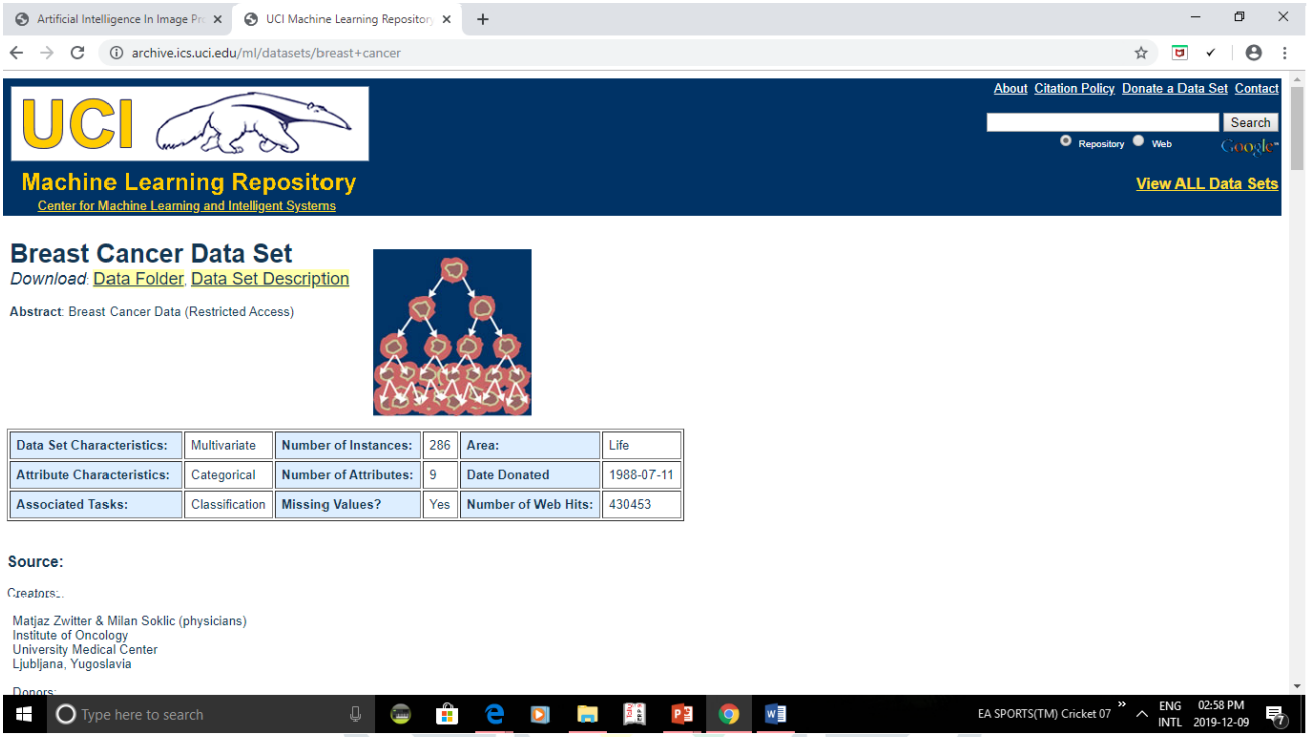



Fig.2: Dataset

**B. Image Pre-processing**

In image pre-processing process taken large amount of image data set and spent the data for the classifier. For large pixels data set as input of CNN classifier, it is spent a more time for every not important information and noise. So, is affecting the last result for classifier.

We have to get more important data, abnormal tissue is cropped and CNN is used for classifier. To get more accuracy using image transformation. When we cropped some image by labelled position. It has blank area which is limitation are for mammogram image. It may effect to the result of classifier. These types of data have been removed from data set for better accuracy.

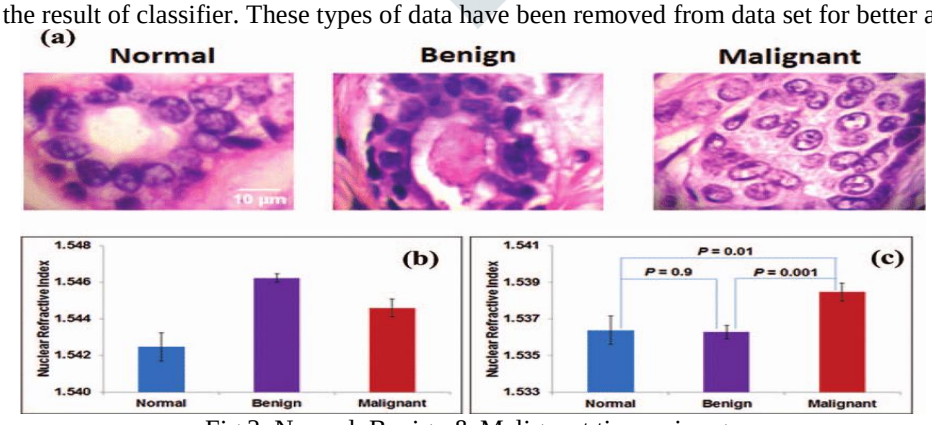



Fig.3: Normal, Benign & Malignant tissues image

**C. Convolutional Neural Network**

Mammogram image analysis database of mammogram image used to target and database that reduce that size of their actual image from 50-micron pixel edges to 200-micron pixel edges and there are 322 grayscale mammograms. Also, important information has come to the database. Database has labeled with their tissues and class of abnormality.

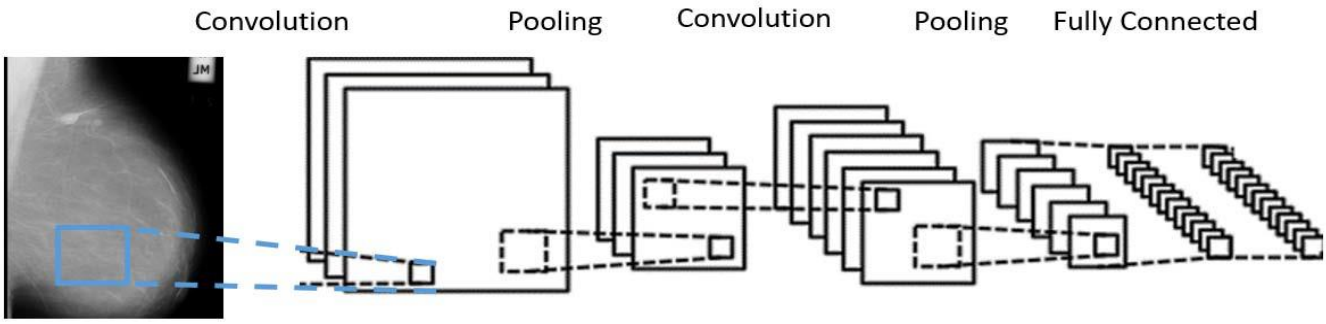



Fig.4: Convolutional Neural Network Process

Most breast cancer tissue size is less than 20% percent from 1024x1024 pixel raw data. For large pixel data as input of the CNN classifier, it will take lot of time for taking information. It's also effects of the last result. CNN is made from neurons and its receives some inputs.

## RESULT AND DISCUSSION

The comparison of proposed algorithm's effect on the classifiers' performance measures (Sensitivity, specificity, accuracy)

| measures | K-NN | A-NN | SVM | Proposed |
|---|---|---|---|---|
| Accuracy | 85.25 | 84.00 | 89.00 | 91.25 |
| Recall | 80.00 | 82.00 | 84.00 | 84.55 |
| Sensitivity | 87.50 | 87.00 | 88.40 | 89.25 |

CPU time utilization

| measures | 100 epochs | | 200 epochs | | 400 epochs | | 1000 epochs | |
|---|---|---|---|---|---|---|---|---|
| | partitioning | seconds | Partitioning | seconds | partitioning | seconds | partitioning | seconds |
| K-NN | 20% | 8.02 | 10% | 9.01 | 12.5% | 25.01 | 25% | 13.5 |
| A-NN | 20% | 13.52 | 15% | 15.02 | 10.5% | 36.05 | 13.5% | 16.5 |
| Proposed | 20% | 9.02 | 12% | 10.05 | 10% | 38.02 | 12.5% | 12.8 |

## CONCUSION

After reading many papers, it can be observed that detection of breast cancer is extremely important to avoid harmful consequences to relevant patients. Hence, the convolutional neural network places a significant role by detecting optimum symptoms using this conventional neural network. As per the base paper in pre-processing steps the mammogram to an image that can be easily recognize by system. Where, CNN model proves better while finding out the difference between labelled data using many types of feature getting from image and exciting model it only takes few minutes to complete without time limit expect any parameter that needs to change. So, here in our proposed to model will try to gain better accuracy with lesser time.

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