



Article Title: An Automatic Detection of Breast Cancer Based On Deep Learning Using Long Short-Term Memory Classifier

An Automatic Detection of Breast Cancer Based On Deep Learning Using Long Short-Term Memory Classifier

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ABSTRACT

This project proposes an automatic detection of breast cancer diagnosis and prognosis based on deep learning using Long Short-term Memory classifier. To reduce the noises in the image, the Adaptive filter is employed at the pre-processing stage. The pre-processed image is segmented by Fuzzy C-means (FCM) segmentation algorithm for active partition of image. The segmented features are extracted by Gray Level Co-occurrence Matrix Method, in which all the essential features are extracted for enhanced classification. An effective classifier, LSTM Classifier is used and final results are predicted. By using LSTM Classifier, the obtained results were accurate. This project is implemented with MATLAB simulation software and the output reveals the classification accuracy.

Keywords: Fuzzy C-means Algorithm, Gray Level Co-occurrence Matrix Method, LSTM Classifier.

1 Introduction

Cancer is a major health problem in the world. Breast cancer has the highest incidence of cancer among the world's female population. In addition, the global incidence of breast cancer is increasing, especially among younger women. Breast cancer has become a significant public health issue over the last years. Each year, more than millions of women worldwide are diagnosed with breast cancer and more than half a million die from it. Although the use of imaging procedures for cancer screening is widespread, biopsy is the only way to know with certainty if the cancer is actually present.

2 Related Works

There are many studies in the literature related to the students' performance using machine learning. Most researchers in this area seek to identify the most appropriate algorithm by which predictions can be made, and to identify the features that can be used for forecasting. In this project, a machine learning based automatic detection of breast cancer using ensemble of classifiers is proposed. MIA's database is utilized to separate the images of breast cancer from mammography. Pre-processing step is used to remove the noise from the input image. Following pre-processing, the image with the noise removed is fed into the



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segmentation block to be divided into numerous segments for removing noise. Segmentation takes place using k-means based segmentation.

3 Research Methodology

The methodology adopted in this paper comprises of four stages: Adaptive Filter for Image Pre-Processing, FCM for Segmentation, GLCM for Feature Extraction, LSTM for Classification

3.1 Adaptive Filter for Image Pre-Processing

Adaptive filters are commonly used in image processing to enhance or restore data by removing noise without significantly blurring the structures in the image. Adaptive filters are self-designing filters according to an algorithm which allows the filter to “learn” the initial input statistics and to track them if they are time varying. An error signal is minimized according to some criterion.

3.2 FCM for Segmentation

The pre-proposed images are segmented by FCM clustering algorithm. Fuzzy C-means (FCM) is a method of clustering which allows one piece of data to belong to two or more clusters. Fuzzy logic is a multi-valued logic derived from fuzzy set theory. FCM is popularly used for soft segmentations. Gives best result for overlapped data set and comparatively better than other algorithm.

3.3 GLCM for Feature Extraction

The segmented regions are processed by the GLCM (Gray Level Co-occurrence Matrix) technique for extracting the features. The co-occurrence matrix includes second-order grey-level information, which is mostly related to human perception and the discrimination of textures. The GLCM is computed in a user defined moving window rather than computing it for the entire image. Using a moving window, neighborhoods of the pixel are defined and then features for each window in an image is computed.

3.4 LSTM for Classification

Recurrent neural networks (RNNs) with a unique property known as long short-term memory (LSTM) networks can selectively retain certain patterns over extended periods of time. LSTM is an unsupervised learning method, although technically, they are trained using supervised learning methods, referred to as self-supervised. It is a variety of RNNs that are capable of learning long-term dependencies, especially in sequence prediction problems. Using LSTM, time series forecasting models can predict future values based on previous, sequential data. This provides greater accuracy for demand forecasters which results in better decision making for the business



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4 Existing System

The existing system provides a method for breast cancer diagnosis and prognosis using machine learning techniques. An overview of ML algorithms including ANN, and ensemble of different classifiers for automatic breast cancer diagnosis and prognosis detection. Classifiers based on machine learning and deep learning is used to increase classification and prediction accuracy. Also compare various ensemble models and other variants of tested ML based models with and without up-sampling technique on two benchmark datasets.

5 Proposed System

In this project, an automatic detection of breast cancer based on deep learning using long short-term memory classifier is proposed. MIAS database is utilized to separate the images of breast cancer from mammography. Adaptive filter is used as the preprocessing method to remove the noise from the input image. Following pre-processing, the image with the noise removed is fed into the segmentation block to be divided into numerous segments for removing noise. Segmentation takes place using Fuzzy c-means (FCM) based segmentation.

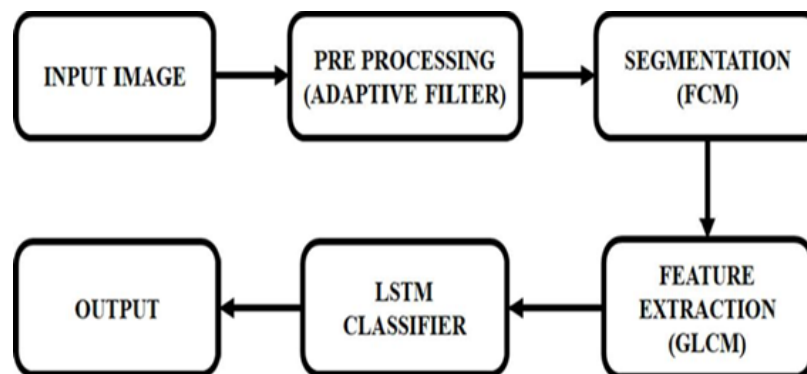


Figure 1: *Architecture diagram*

6 Results and Discussion

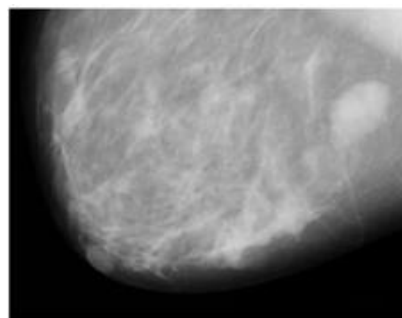


Figure 2: *Input Image*



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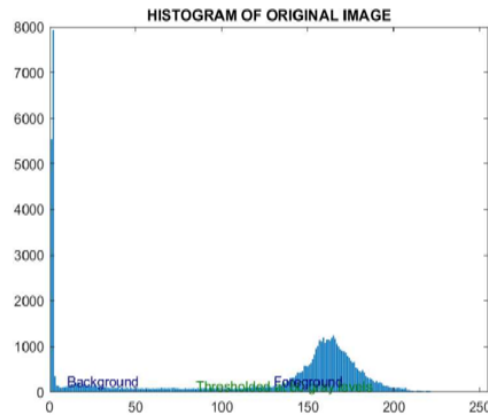


Figure 3: Histogram of Original Image

```
Centers converged in 15 iteration.

ans =

train data

Class List in given sample
0
1

Total Instance = 50
class1==>0
class2==>1
Two-Class Confusion Matrix
''
'FalseNegative'  ['TruePositive'  'FalsePositive'
'TrueNegative=TN'  ['          11]  ['          14]
                  ['          15]  ['          10]

Over all values

c_matrix =

    11    14
    15    10

Result =

Accuracy: 92.4200
Error: 0.5800
Sensitivity: 90.4400
Specificity: 89.4000
```

Figure 4: Accuracy

7 Conclusion

A deep learning classifier using long short-term memory is used in this project in order to detect breast cancer automatically. Feature extraction, segmentation, and classification are the modules that comprise the proposed technique. Noise is removed from an input image by applying an adaptive filter. Following noise removal, the image is fed into the segmentation block, which divides it into numerous segments. In order to segment the data, fuzzy c-means (FCM) segmentation is applied. By extracting several features from the



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segmented regions, the necessary features are selected to improve classification. The effective GLCM (Gray level co- occurrence matrix) technique is used in this project to find and select features. Finally, LSTM (Long Short-term Memory) classifiers are used for accurate classification. In general, the proposed solution outperforms the previous methods in terms of effectiveness.

Future Scope

In future work, the research can be further expanded to include the genetic algorithm. A more effective approach for the genetic algorithms will be explored by including CNN's classification method for getting effective classification output.

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