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Complexity analysis of deep learning image classification methods for Breast Malignancy

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Abstract

Brest cells malignancy is one of the major reasons of women death in all over the world. The malignant cells calculation is now more accurate and easy with the deep learning approaches developed for image classification. By use of these deep learning methods early detection of breast cancer is possible. This article shows different approaches of deep learning i.e. logistic regression, sequential minimal optimization, random forest and hyper parameter technique and comparison between these to show that deep neural technique is more accurate than other approaches.

Keywords: malignancy; Deep Learning; calculation; deep neural technique.

1. Introduction

Worldwide, it is found that breast cancer is a global problem of occurrence and is posing amajor threat to all women. The cases of breast cancer disease are increasing all over the world, due to changes in the lifestyle of society [1]. Especially in the health care sector where these systems are broadly used for Prediction and evaluation of the performance of datasets. Prediction of medical data is a crucial challenge in the area of artificial intelligence. In our deep study of this research paper, we found the best classifier model for predicting breast cancer disease which can be helpful for the health care sector [2] [3]. This study is trying to obtain the best accurate result with the help of classification techniques and explore important knowledge from raw datasets applied to machine learning models. Breast cancer prediction can be done using various worldwide medical datasets of breast cancer patients [4]. In the medical area, we try to find out knowledge from these datasets which are broadly used for the analysis and prediction of breast cancer disease [5]. Although various types of machine learning models already exist for comparative analysis of the disease, we can also produce new models for prediction of the disease [6]. In women, when breast tissue cells grow abnormally and divide uncontrollably they may develop into a form of tumour tissue. This tumour tissue may be either a malignant tumour or a benign tumour [7]. The malignant tumour is very harmful and can spread into other areas of body. Although benign tumour only grows in the area of origin and chances of spreading in another part of the body is very less [8].

2. Literature survey

Recently, with the use of artificial intelligence, a lot of studies have been done to find out how todiagnose breast cancer in women at an early stage [9]. Many researchers proposed different typesof machine learning algorithms on breast cancer datasets and examined their outcomes, out of which some algorithms are described here.

Dursun Delen et al. [10] compared the three predictive statistical models which have ANN, Logistic Regression and DT applied to breast cancer datasets that are taken from SEER. They used a 10-fold cross-validation technique for predicting breast cancer disease on that given dataset. They found that the decision tree model gives better results at 93% accuracy compared to ANN and LR models.

Abhishek Taneja [11] has worked on the classification methods that produce a classifier for recognition of heart disease analysis with help of neural network, Bayesian classifier, and decision tree. The heart disease dataset has been taken from PGI, Chandigarh. They used a 10- fold cross-validation method to obtain the result. After computation, they found that J48 has a good method that produces 95% correct results for heart disease.

Vikas Chaurasia et al. [12] in their studies, took a breast cancer dataset from UCI machine learning, applied these datasets on SMO, IBK, and BF tree classification methods on the Weka tool and compared the outcome. They concluded that among these algorithms Sequential Minimal Optimization (SMO) gives high truthfulness results of 96.2% accuracy which is better compared to the rest of the classification techniques.

3. Intelligent Medical Monitoring Model for Breast Cancer Prediction(IMMMBCP)

This research paper shows a Deep Neural Network Model for Breast Cancer Prediction and compares the results with the other machine learning techniques for breast cancer Figure 1 show the entire process of our methodology of the model (IMMMBCP). This dataset has been taken from the UCI Machine Learning site in online mode to train and test the method. The original Collected Raw Breast Cancer dataset contains 699 recordsand 11 attributes among them this dataset also contains 2 target classes 458 have Non- cancerous and 241 have cancerous types. This dataset was converted into CSV file format.

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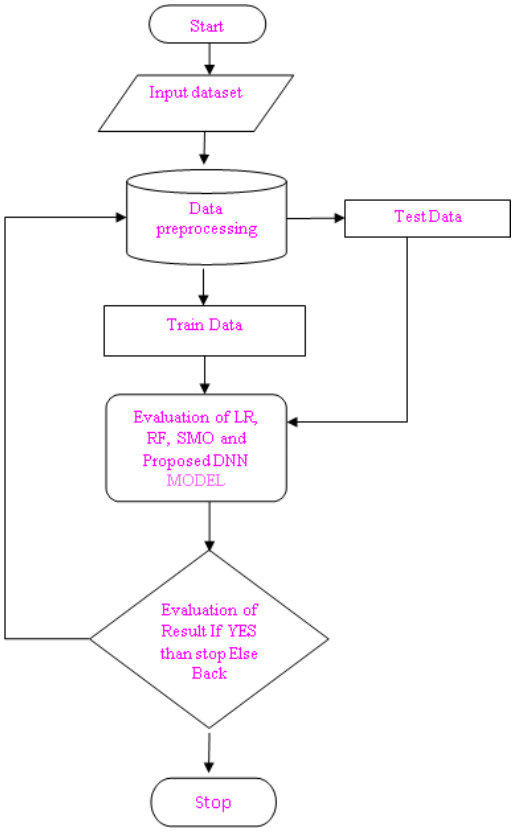

Figure 1: Intelligent Medical Monitoring Model for Breast Cancer Prediction

3.1 Data Pre-processing

Data pre-processing is an important stage of detecting breast cancer disease. If without data pre- processing, we apply a dataset directly to the model, it may predict the wrong outcome. Therefore, the pre-processing stage plays an important role in predicting breast cancer prediction. Basically, Data pre-processing consists various steps, among them cleaning Missing Data, Normalization, Attribute Selection and Attribute Weighting are the most important ones.

3.2 Deep Neural Network Model for Breast Cancer prediction

After data pre-processing, the breast cancer dataset has 10 features and 683 records left among which Non- cancerous: 445, cancerous: 238. We split the whole dataset into 90% train dataset and 10% test dataset. Fully connected Deep neural network model for breast cancer prediction shows in figure 2. Deep neural network model consists of four layers, in which first one layer is the input layer, two layers are hidden layers, and the last one is the output layer and a back-propagation in a recurrent feed-forward neural network. To train the model, attributes of the breast cancer dataset are applied on the model. LogitBoost (a boosting algorithm) is used that increases the performance of model to obtained better accuracy.

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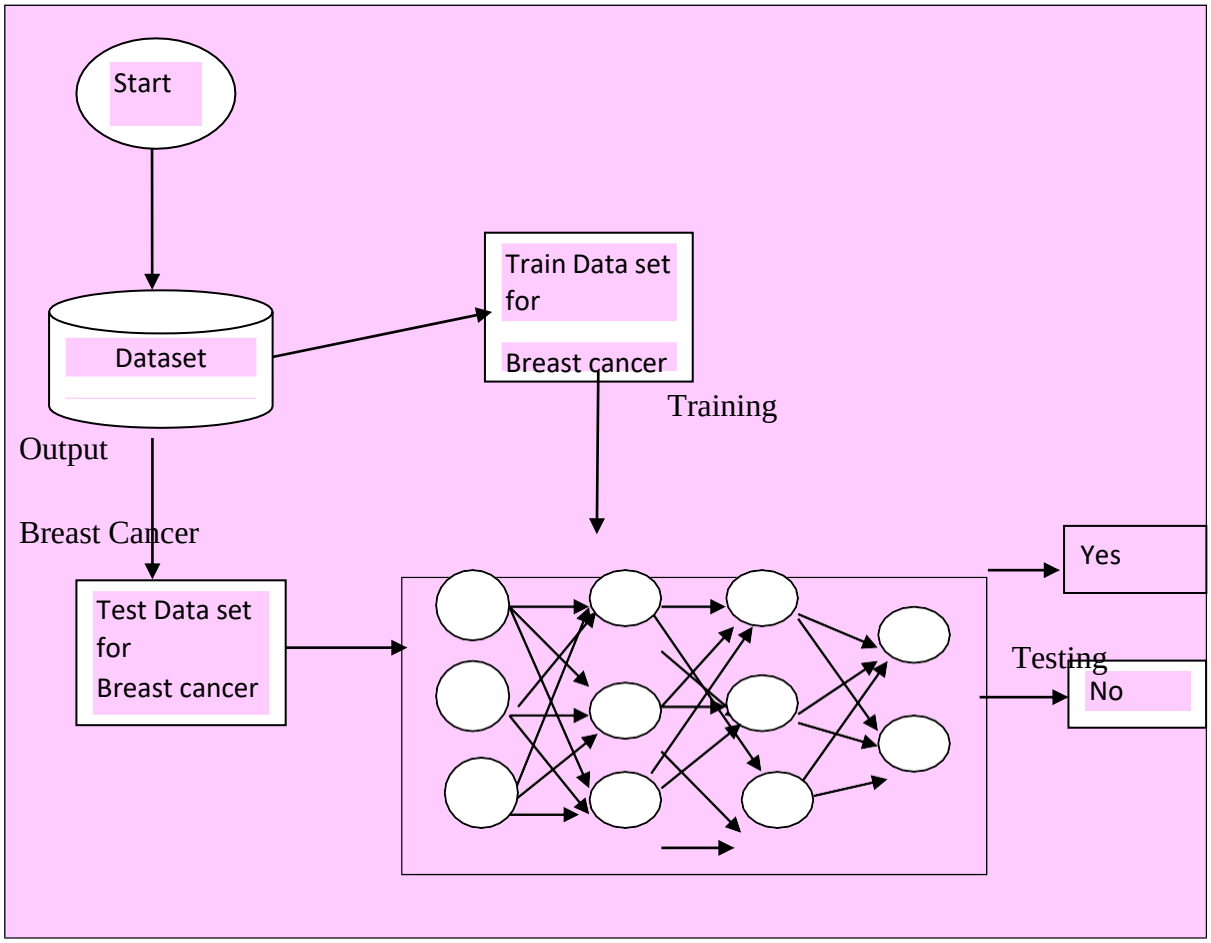

Figure 2: Deep Learning Model

After that, the machine learning classification technique with respect to Logistic Regression (LR), Random Forest (RF) and Sequential Minimal Optimization (SMO), respectively, to compare the classifier model is performed. Machine learning algorithms and the suggested model are used to perform comparative classification analysis of breast cancer illness datasets. figure 3 shows the comparison of different methods.

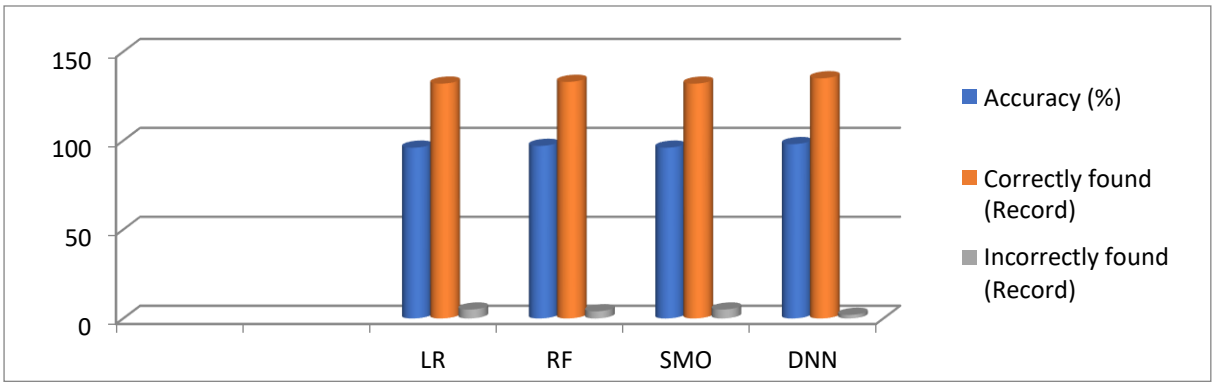

Figure 3: Various models represent graph of comparative evaluation criteria.

4. Conclusion

This paper represents the task of four machine learning models to predict breast cancer disease. We used the Weka and python programming tool on the Wisconsin Breast Cancer Dataset to predict breast cancer at an early stage of the patient. Further, we applied the machine learning method: Random Forest, Sequential Minimal Optimization, Logistic Regression and proposed Deep learning model on the breast cancer datasets for diagnosis of the disease. We tried to find the validity and productivity of these methods in order to explore the best prediction model.

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