Chapter 7
Breast Cancer Detection Using a PSO–ANN Machine Learning Technique

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ABSTRACT

Machine learning is employed in all facets of life. Breast cancer has been known to be the second most severe cancer that leads to death among women globally. The use of dimensionality reduction to reduce noise and eliminate irrelevant features from dataset is of enormous significant on breast cancer detection. In this study, particle swarm optimization (PSO) algorithm was employed to select relevant features from the data with artificial neural network for classification purpose on a University of California Irvine machine learning database dataset. The study was evaluated with the findings revealing the performance of the study at 97.13% accuracy. Conclusively, the aim of this study is to improve machine learning approach for breast cancer detection. This paper will be of help to radiologists in taking accurate results and making proper decisions regarding breast cancer early diagnosis based on machine learning.

INTRODUCTION

The notable reason for women's mortality and injury from a global viewpoint is breast cancer. A study shows that 508,000 women died of chronic illnesses, especially breast cancer, in 2011(WHO, n.d.). Global deaths caused by CHD (WHO, n.d.) were around 17.7 million people in 2015. The World Health Organisation (WHO) predicted that above 23.6 million people will be dead by 2030, because of such chronic illnesses (Saxena and Sharma, 2016). A few patients are eligible to receive treatment, but most chronic illness treatment scenarios are very costly and complicated (Singh et al., 2018). Also, this justification for taking a long time will lead to death and incorrect or postponed choices. However, the expense of diagnosing and replacing breast cancer is very extreme and may be considered an extreme degree of financial spending. A survey estimated that cancer induces commercial gains at a cost of over $79 billion and that it costs over $35 billion to treat persons with end-stage renal disease ("Chronic Kidney Disease Basics", n.d.). A breast cancer diagnosis is chronic and takes a long time to cure. For these reasons, most people are unable to bear the expense of cancer disease care. The prediction of chronic illnesses is the most influential matter for the precise decision of certain disorders for health professionals and patient care centers.

Machine learning algorithms are an effective approach for predicting breast cancer disease outbreaks. Therefore, a framework to address these disease concerns through early detection and diagnosis is suggested. The growth rate of medical data has gone from huge arenas to large volumes over the last ten years. Algorithms from the art of Machine Learning (ML) have represented the intent of addressing different health and scientific problems (Shamrat et al., 2019; Rahman et al., 2019). The development of many studies indicates that in disease-based medical problems, ML models have already attained significantly excessive accuracies. However, one of the biggest approaches for academic and therapeutic areas is the supervised-based model classification (Dwivedi, 2018).

Several efficient classifiers exist such as the SVM, KNN, ANN, K-means, Decision trees, and Ensemble, among others which help in the diagnosis and prediction of diseases (Oladele et al., 2019; Adegun et al., 2018, 2020; Adebiyi et al., 2019a, 2019b 2020a, 2020b; Ayo et al., 2020; Yesilkanat et al., 2017; Oladele et al., 2020; Yesilkanat and Kobya, 2015; Breiman, 2001; Popoola et al., 2018; Ikedinachi et al., 2019; Behera et al., 2018, 2020, 2019), The key aim of this study is to enhance the PSO algorithm for the classification of breast cancer dataset Therefore, with machine learning techniques, this research proposes a significant approach to predicting the presence of breast cancer. This research likewise aims to ensure that the ML prognostic method can recognize early signs of breast cancer by forecasting the experimental model. The evaluation assessment of the study is then compared with the state of the art. Other aspects of this study are expressed in the following way. Section 2 offers a summary of what has been done in the literature on breast cancer and which ML algorithms have been utilized on them. Section 3 outlines the proposed methods precisely. The results and discussion were evaluated in section 4. Finally, this work is concluded in Section 5 and proposes possible future research.

RELATED WORKS

Our main feature is to develop a method by utilizing the ML technique for analyzing medical data as well as cancer diseases. Several experiments have been performed to implement and use multiple ML

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