Deep Learning Method Based for Breast Cancer Classification

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***Abstract* - The most prevalent cancer in women worldwide and one of the main factors in cancer-related mortality is breast cancer. Extensive research efforts have been dedicated to early detection, diagnosis, and treatment of breast cancer to reduce mortality rates. This research aims to achieve accurate diagnosis of breast cancer and classify breast cancer using deep learning method. The study proposes deep learning techniques with Adam's optimization and two hidden layers for breast cancer classification. Addressing challenges such as data instability and overfitting during deep learning training, the research focuses on updating network weights. The experiments examine two hidden layers and varying learning rates to enhance classification accuracy. The datasets utilized in the experiments include the WBCD dataset (Original), the WDBC dataset (Diagnostics), and the Coimbra dataset. Additionally, the proposed scheme's accuracy is compared against existing benchmarks for breast cancer detection. The experimental findings show that the suggested scheme outperforms other benchmarks, achieving an impressive 96% accuracy in breast cancer classification.**

Keywords: Breast Cancer, Deep Learning, Classification Method, Adam Optimization

I. INTRODUCTION

According to research published in 2019, invasive breast cancer affects more than 250,000 women in the United States annually. The second-leading cause of death for female cancer patients is breast cancer. A typical growth of breast cells can rapidly invade and spread to other parts of the body. In order to prevent cancer from spreading to the entire breast or other body areas, it is crucial to identify it early and begin treatment [1]. Inadequate knowledge of early detection is also responsible for 15% of breast cancer deaths [2]. There are two main types of breast cancer: benign and aggressive. While benign tumors, also known as non-cancerous tumors, are generally left untreated as they pose less threat to surrounding tissues, they can still cause discomfort or complications. On the other hand, malignant tumors, referred to as cancer, are highly aggressive and have the potential to harm nearby tissues. If cancer is suspected, a biopsy is performed to assess the tumor's severity and aggressiveness. The primary cause of breast cancer is genetic mutations inherited by patients. Breast lumps, breast form changes, skin dimpling, nipple discharge, and spread to other body areas are all possible symptoms of breast cancer. However, earlier detection of breast cancer will often increase life expectancy and lower the mortality rate of the afflicted victims [3]. Thus, in order to improve the survival rate and ensure early breast cancer identification, a good diagnostic technique is always crucial.

Recent years have seen significant progress in the detection and treatment of this cancer due to the fact that early diagnosis can significantly impact the patient's recovery and course of therapy [4][5]. Early diagnosis of breast cancer is crucial for timely treatment, rapid recovery, and reducing the risk of death [6]. Human diagnostic errors may occur due to incomplete data [7][8]. Although improvements in breast cancer treatment have decreased mortality rates across the board, youthful age continues to be a key risk factor for lower survival rates [2]. Given the severity of the disease, a computer-aided detection system (CAD) utilizing machine learning (ML) techniques is necessary for breast cancer diagnosis [9]. Hence, improving breast cancer diagnosis accuracy is crucial [10].

As a result, numerous efforts were undertaken to create and apply Artificial Intelligence (AI) approaches in diagnosing, forecasting, and categorizing breast cancer. Various classification methods can be used to categorize and differentiate between benign and malignant breast cancers. In their study, Idris and Ismail [11] compared the accuracy of breast cancer prediction using methods such as SVM, C4.5, Naive Bayes, Random Forest, KNN, and Fuzzy-ID3. The experiment employed three datasets: the original WBCD dataset, the diagnostic WBCD dataset, and the Coimbra dataset. They applied Fuzzy-ID3 for breast cancer classification, overcoming the limitations of the conventional ID3 algorithm in handling continuous-valued data. However,

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