2023 International Conference on Emerging Research in Computational Science (ICERCS) | 979-8-3503-5976-3/23/$31.00 ©2023 IEEE | DOI: 10.1109/ICERCS57948.2023.10434110

An Experimental and Clinical Study on Advanced Breast Cancer Detection Using Convolutional Neural Networks with Improved Optimization Techniques

[1st] Nithya R, [2nd] Radhika D, [3rd] Rajeswari K, [4th] Saranya A
Vivekanandha College of Engineering for Women,
Tiruchengode, Tamilnadu(India)
* nithyaravicse@gmail.com

***Abstract*—One of the most common and fatal cancers impacting women globally is breast cancer. For the best chance of survival, breast cancer must be found early. In order to help detect cancer, Convolutional Neural Networks (CNNs) have been effectively used in medical picture analysis. However, the presence of noise, artefacts, and other variables in medical pictures frequently affects how well CNNs work. It has been discovered that the performance of CNNs in a variety of applications may be enhanced by the use of sophisticated optimisation techniques. The aim of this study is to investigate the effectiveness of applying improved optimization techniques, namely, the Monarch Butterfly Optimization (MBO) algorithm, in conjunction with CNNs for advanced breast cancer detection. Our study compares the performance of CNNs with traditional statistical methods, such as receiver operating characteristic analysis on breast cancer imaging datasets. We also evaluate the clinical usefulness of CNNs in breast cancer detection in clinical settings. Our experimental results indicate that CNNs with improved optimization techniques achieve high accuracy in breast cancer detection and have the potential to improve the reliability of conventional diagnostic methods. Furthermore, the clinical findings demonstrated the feasibility of using advanced CNN models, combined with novel optimization techniques, for early breast cancer detection. The findings of this study will advance the field of medical imaging and contribute to better cancer management and treatment options for women.**

***Keywords*—Convolutional neural networks, Breast cancer detection, Image Analysis, Medical Imaging, Classification, Butterfly Monarch Optimization.**

I. INTRODUCTION

Breast cancer is the most frequent disease among women overall, with over two million new cases diagnosed each year. Breast cancer mortality rates are greatly reduced when detected and treated early. Mammography, ultrasound, and magnetic resonance imaging (MRI) are three medical imaging modalities that are frequently used for breast cancer screening and diagnosis [1]. The presence of noise, artifacts, and a low signal-to-noise ratio in medical images, on the other hand, may impair the performance of standard detection methods, resulting in false positives or false negatives. Breast cancer screening can be made more accurate and specific in a variety of ways, most notably by utilizing computer-aided diagnostic (CAD) systems. The introduction of Convolutional Neural Networks (CNNs) and deep learning techniques has caused a paradigm shift in the discipline. These methods have proven to be highly effective for image segmentation, classification, and identification applications. CNNs have sparked a lot of interest in the field of medical image analysis because they can accurately extract high-level information from medical pictures. However, when analyzing medical images, noise, artifacts, and other variables may have a negative impact on CNN performance [3,4]. Several optimization solutions have been developed to solve these issues and improve CNN's functionality in medical image processing. Breast cancer screening can be made more accurate and specific in a variety of ways, most notably by using computer-aided diagnostic (CAD) systems. The development of Convolutional Neural Networks (CNNs) and deep learning techniques has caused a paradigm shift in the discipline. These methods have proven to be quite effective for image segmentation, classification, and recognition applications. CNNs have generated a lot of attention in the field of medical image analysis because they can accurately extract high-level features from medical pictures. However, when analyzing medical images, noise, artifacts, and other factors may have a negative impact on CNN performance [5]. To solve these issues and improve CNN's functionality in the field of medical image processing, several optimization algorithms have been developed. The dataset will be labeled with the required labels indicating the presence or absence of breast cancer. Following training with the MBO approach, the performance of our CNN model will be compared to

979-8-3503-5976-3/23/$31.00©2023IEEE

Authorized licensed use limited to: VIT University. Downloaded on May 07,2024 at 07:43:04 UTC from IEEE Xplore. Restrictions apply.

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous) TIRUCHENGODE Pin - 637 205.

PRINCIPAL
Vivekanandha College of Engineering for Women, (Autonomous)
Tiruchengode (Tk.) Namakkal (Dt.)
Tamilnadu - 637 205.