ROLE OF ARTIFICIAL NEURAL NETWORKS IN BREAST CANCER DETECTION

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Abstract- Cancer are some of the most severe diseases, yet there is no long-term level of care, according to reports. The most popular sort of cancer is breast cancer (BC). Based on the National Breast Cancer Institute, there will be over 281,550 new cancer disease cases and 49,290 reported cases of non-invasive breast cancer in the United States alone in 2021. (NBCF). To place all such estimates into context, patients have a 99% chance of survival because 64% of such possible circumstances are treated early in the disease's progression. An artificial neural network ANN is used in this research to develop a model that can predict breast diseases like cancer. By supporting identification and treatment, the appropriate use of artificial intelligence (AI) and machine learning (ML) in the identification and treatment of a variety of fatal diseases has promote patient survival rates. The proposed model outperforms the Just JNN environment algorithm, which acquires an accuracy of 88.24%.

Keywords: - *Breast Cancer, Artificial Neural Networks, Breast Cancer Prediction*

1 INTRODUCTION:

Breast cancer (BC) is the leading effect of mortality in women across the globe. Recently, 41,760 women and more than 500 men lost their lives to breast cancer, corresponding to the American Cancer Society. The four main subtypes of breast cancer are benign, invasive, and normal. Minor alterations to the breast's structure are caused by benign tumors. It has no negative effects and is not dangerous cancer. The mammary vessel lobule process is the single tissue unaffected by in-situ carcinoma, which occurs only there. If discovered in its early stages, this type is not harmful and is treatable. Due to its ability to spread to all other organs, invasive carcinoma is regarded as a highly hazardous kind of BC (Nassif et al., 2022).

Therefore, it is important to effectively and accurately detect breast cancer. Breast cancer detection techniques include X-ray mammography, ultrasound, processed tomography, PET, magnetic resonance imaging (MRI), and breast temperature monitoring (Zhou et al., 2020). Typically, a pathological treatment plan is the benchmark for detecting breast cancer. In order to enhance exposure, the removed body part is seriously affected in the lab until being imaged. Hematoxylin and eosin (H&E) are quite often used in the staining process.

In order to identify and detect breast cancer, many AI and ML techniques have been used. The main determinant of accuracy in the identification of BC disease is the diagnostic tool's capacity to distinguish between benign and malignant abnormalities. Any nonlinear relationship between variables is permissible using ANNs. For this flexibility, additional modeling techniques are required for traditional statistical approaches (like logistic regression). Additionally, distributional assumptions are not necessary when using ANNs. The application of ANN for medical outcomes has attracted a lot of interest due to these benefits. Clinical patient management can be enhanced by evaluating breast cancer disease (Patani et al., 2013).

2 LITERATURE REVIEW:

Multiple researchers have previously worked on the prediction of breast cancer with the help of ANNs. Some of their works are presented in this section.

The authors of this study employ a single CNN without any kind of fusion. Based on trained models, a number of research studies embed many lingering sections in the convolutional tier. The convolution tier and lingering sections combination performed well, with a precision of 92.19 percent (Krishnan et al., 2018).

The best performance is 96.42 percent of instances correctly classified when the following neural network (NN) configuration is employed, according to the authors of this research. They apply ANNs with different parameters like different numbers of hidden layers, learning rates, and momentum. (Input tier, hidden tier, and output tier counts are 9, 2, 2, learning rate, 0.2, and momentum, 0.7, respectively (Zheng et al., 2017).

The authors presented a comparison of an authentic genetic algorithm (GA), a back-propagation neural network (BPNN), and a digital binary GA model utilising breast cancer set of data, disclosing accuracies of 96.50 %, 93.10 %, and 94.00 %, including both (Örkcü and Bal, 2011).

Using the WDBC sets of data without selecting features, the researchers assessed the performance of a GA to that of multiple other roughly equivalent classifiers, namely a particle swarm classifier (PSC) and an ANN. The study had accuracy rates of 96.40, 96.50, and 96.10 %, combined(Aalaei et al., 2016).

The researchers used an evolutionary neural network approach based on machine learning to categorize breast cancer. The study focus on limitation optimization of the NN model using the Adaptive Particle Swarm Optimization (APSO) technique. In the NN's single hidden tier, 20 neurons were used. The WDBC dataset was used, which was split into 30% for testing and 70% for training. The model was trained using back-propagation (BP), traditional PSO, and APSO. The experimental results showed that APSO-NN had the highest classification accuracy of 98.24 %(Quy et al., 2021).

The authors of this study presented many ML models created to identify BC using the Wisconsin breast cancer dataset (WBCD), and they evaluated their accuracy by focusing on the years 1996 through 2017. Ten models used ANN, nine utilized SVM, seven used decision trees (DT), and three utilized k-nearest neighbors out of the 29 models (k-NN). Although each model used a different algorithm to pick, minimize, and boost the features prior to swallowing them into the ML model, all models demonstrated high accuracy performance. Additionally, ANN was supposed to perform better than other models at pattern recognition in (Alshayeji et al., 2022).

According to the authors, ANN models will shortly be useful in a wide range of fields and used in a variety of pattern recognition (PR) applications. The most effective models for upcoming applications that may focus on numerous challenges in PR can be suggested using the thorough research, review, and brilliant cognitive computational approach of ANN to PR. The recognizer can resolve straightforward, complicated, and multi-complex problems by using multiple ANN models. A better solution can also be obtained by developing a brand-new model specifically for a given problem (Abiodun et al., 2019).

Most of the approaches have been used while employing and constructing several smart as well as intelligent frameworks like machine learning approaches(Ali et al., 2021, 2022; Ali Raza et al., 2022; Asif et al., 2021; Aslam et al., 2021; Chayal and Patel, 2021; Dekhil et al., 2019; Fatima et al., 2020; Ghazal et al., 2022b; Khan et al., 2021; Muneer and Rasool, 2022; Saleem et al., 2022; T. Mohamed et al., n.d.), Fuzzy Inference systems (Abbas et al., 2019; Areej Fatima 1 and Adnan Khan 1, Sagheer Abbas 1, 2019; Asadullah et al., 2020; Aslam et al., n.d.; Gollapalli et al., 2022; Hussain et al., 2020; Ihnaini et al., 2021; T. A. Khan et al., 2020; Saleem et al., 2019), Particle Swarm Optimization (PSO) (Iqbal et al., 2019; Kurdi et al., 2022), Fusion based approaches(Gai et al., 2020; Ma et al., 2020; Muneer and Raza, 2022; Sharma et al., 2021; Tabassum et al., 2021; Taher M. Ghazal, n.d.) ,cloud computing (Bukhari et al., 2022; Dr. Adnan Khan and Sagheer Abbas, 2018; W. A. Khan et al., 2020; Khan, 2022; Naseer, 2022; Siddiqui et al., 2021; Ubaid et al., 2022), transfer learning(Abbas et al., 2020; Ghazal et al., 2022a)**,** Block chain technique(Abbas et al., 2021; Rehman et al., 2022) and MapReduce(Asif et al., 2021) which might be beneficial in developing evolving alternatives for the arising difficulties of creating smart cloud-based able to monitor management systems.

3 PROPOSED METHODOLOGY

The purpose of this study work is to highlight that every year amount of casualties is expanding enormously because of BC. It is the highly often kind of all cancer and the main reason for death in women globally. Any improvement for the prediction and identification of cancer illness is essential for a healthful life. ML techniques may bring a huge contribution to the system of forecast and early identification of BC, and have been shown as a strong technique. In this research, an Artificial Neural Network-based machine learning approach is introduced to predict the cancer disease at an early stage that may be helpful for the patient as well as a healthcare specialist.

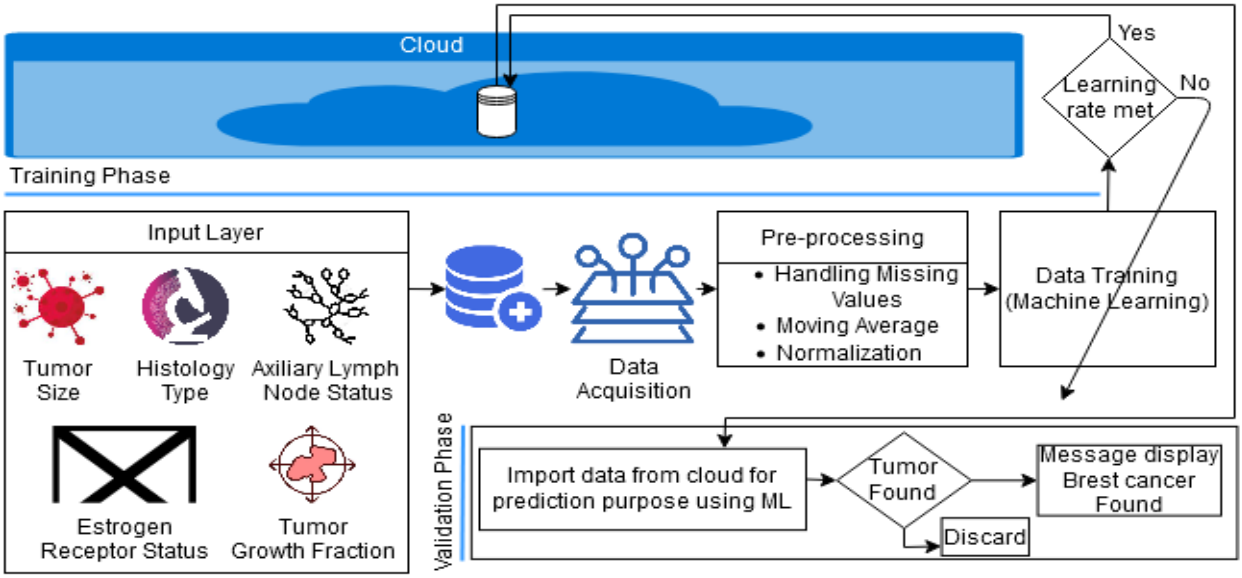

Figure 1: Proposed model

Figure 1 depicts the transition of patient data to the data capture layer, which keeps the information obtained from the database in its raw form. The original data is sent to the pre - processing layer, which removes noise by using normalization, missing value processing, and moving averages. Following that, the data is trained using a machine learning approach. In ANN, the input layer, hidden layer, and output layer are all used. The trained data is then secured in the cloud and exporting for forecasting using the ML methodology. During the testing stage, it is determined the extent to which breast cancer was discovered. If no, the functionality is cancelled; if yes, the update states that breast cancer was discovered.

4 LIMITATIONS AND FUTURE DIRECTIONS

In recent times, several ML approaches have been utilized in the medical field to predict different diseases, particularly breast cancer disease. Several traditional healthcare systems are employed for accurate breast cancer disease prediction but face many challenges. For example, the authors used Haberman's Breast Cancer Survival dataset and applied the Just NN (JNN) environment algorithm (Nassif et al., 2022) then they achieved 88.24% accuracy. In this research, a healthcare model is developed by utilizing Artificial Intelligence that predicts breast cancer disease with more accuracy as compared to the JNN environment. In the future, the proposed model may show better accuracy for lung cancer disease prediction.

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