AN EFFECTIVE APPROACH TO NOVEL CONVOLUTIONAL NEURAL NETWORK ALGORITHM COMPARED WITH WATERSHED TRANSFORM ALGORITHM IN BREAST CANCER USING PRECISION

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Abstract

Aim: The Objective of the work is to predict the Accuracy of Breast Cancer Prediction Using a Novel Convolutional Neural Network (NCNN) Comparative with the Watershed Transform Algorithm (WTA).
Material and Methods: Accuracy and Loss are performed with a dataset from the GitHub library. The total sample size is 48. The two groups Novel Convolutional Neural Network (N=24), Watershed Transform Algorithm (N=24) watershed transform algorithm (WTA) was proposed by predicting the accuracy (80.90%) of Breast Cancer Prediction compared with the Novel Convolutional Neural Network.
Results: The Result proved that the watershed Transform algorithm with Better accuracy than the Convolutional Neural Network. The Novel Convolutional Neural Network appears significantly better than Watershed Transform Algorithm ($p<0.05$).
Discussion and Conclusion: The Prediction of breast cancer is better in novel Convolutional neural networks when compared with the watershed transform algorithm (WTA).

Keywords: Breast Cancer, Watershed Transformation Algorithm, Lymph, Novel Convolutional Neural Network, Machine Learning Algorithm, Accuracy.

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1. Introduction

Different areas of the breast can become the site of breast cancer. ((Acostamadiedo Marx et al. 2021). An organ, the breast is located over the upper ribs and chest muscles. Both the left and right breasts include mostly fatty tissue, ducts, and glands. For the purpose of feeding babies and infants, women's breasts produce and secrete milk. The size of each breast is determined by the quantity of fatty tissue there is. ((Altundag 2019).Your body's immune system includes the lymph (or lymphatic) system. It is a network of organs, ducts, and lymph nodes that cooperate to gather and transport clear lymph fluid through the bodily tissues and into the blood. Lymph nodes are tiny, bean-sized glands. Immune cells, waste materials from tissues, and clear lymph fluid are all present in the lymph channels ((Guani et al. 2021). There is a greater likelihood that cancer cells have metastasized, or spread to other parts of your body if they have already reached your lymph nodes ((Leong 2021). Some women without cancer cells in their lymph nodes may later acquire metastases, and not all women with cancer cells in their lymph nodes do so.

Additionally, distinct types of proteins or genes that each tumor may produce are used to categorize breast tumors. Breast cancer cells are examined for the HER2 gene or protein and estrogen and progesterone receptors following a biopsy ((Huang et al. 2021). To determine the grade of the tumor, the tumor cells are also examined carefully in the laboratory. The particular proteins discovered and the tumor grade can be used to determine the stage of cancer and available treatments ((H. Zhang et al. 2021). Proto-oncogenes, which are genes found in normal cells, assist regulate when the cells grow, divide to form new cells or stay alive. A proto-oncogene can develop into an oncogene by undergoing specific mutations. These mutant oncogenes can cause cancer in cells ((Shidahara et al. 2021). Additionally, tumour suppressor genes exist in normal cells, which help regulate the frequency of cell division, the ability to correct DNA errors, and the timing of cell death. A cell can develop into cancer if a tumour suppressor gene has been altered.

Our team has extensive knowledge and research experience that has translated into high quality publications (K. Mohan et al. 2022; Vivek et al. 2022; Sathish et al. 2022; Kotteeswaran et al. 2022; Yaashikaa, Keerthana Devi, and Senthil Kumar 2022; Yaashikaa, Senthil Kumar, and Karishma 2022; Saravanan et al. 2022; Jayabal et al. 2022; Krishnan et al. 2022; Jayakodi et al. 2022; H. Mohan et al. 2022). In a previous study, the efficiency improvement of the watershed transform algorithm (WTA) in Data retrieval was not properly considered to increase accuracy. To overcome this issue a Convolutional Neural Network is implemented to improve secured data retrieval with reduced time in machine learning.

2. Materials and Methods

The research is done in the Saveetha School of Engineering's Machine Learning Laboratory at the Saveetha Institute of Medical and Technical Sciences in Chennai. Using the GPower programme and comparing the two controllers in the Supervised learning process, the sample size has been determined. (Ayaz et al., n.d.). For the purpose of comparing the procedure and the outcome, two numbers of groups are chosen. For this work, a total of 20 samples are chosen, with 10 sets of samples from each group. The pre-test power value is calculated using GPower 3.1 software (g power setting parameters: =0.05, power=0.80, statistical test difference between two independent means, t-test value=147.581.Two algorithms (WTA and Novel Convolutional Neural Network Algorithm) are implemented using Technical Analysis software. Since no human or animal samples were used in this study, there is no need for ethical approval.

Convolutional Neural Network

Breast cancer is regarded as a fairly frequent form of cancer in women and develops in breast cells. After lung cancer, breast cancer is the second most serious illness that can kill a woman. This study suggests using convolutional neural networks (CNNs) to analyse hostile ductal carcinoma tissue zones in whole-slide images to improve the automatic detection of breast cancer (WSIs). The proposed method for automatically detecting breast cancer using several convolutional neural network (CNN) architectures is examined in this study, and the outcomes are contrasted with those from machine learning (ML).

Watershed Transform Algorithm

To examine photos on a detailed level, segmentation techniques are needed. This segmentation is necessary for the Huygens software's Object Analyzer. Using the garbage volume extension and the Seed And Threshold method, an easy-to-use but efficient method of object detection is demonstrated. However, when objects are very close to one another and point spread function blurrings are present, this strategy is ineffective. In those circumstances, the watershed segmentation approach offers a way to

separate objects that might otherwise combine into a single object. The drawback of the watershed method is that it is very sensitive to local minima because a watershed is formed at every minimum. If your image contains noise, it will affect how it is segmented. Sigma controls how strong a Gaussian filter is used to smooth the image and remove these minute local minima. The watershed segmentation is now more functional as a result. The user has control over this sigma's level. However, keep in mind that if the sigma is set too high, the watershed locations might not be what you anticipate (shifted due to the Gaussian blurring). Collaborative Python software is used to assess CNN and WTA. The hardware configuration comprises an Intel i7 processor and 8GB of RAM. Windows 10 64-bit was the operating system that was used.

Statistical Analysis

For statistical analysis of the WTA algorithm- and Novel Convolutional Neural Network-based approaches, SPSS software is employed. Efficiency is the dependent variable, and CNN accuracy is the independent variable. For both approaches, the accuracy of the CNN is calculated using an independent T-test analysis.

3. Results

Below Table shows the simulation result of the proposed algorithm Novel Convolutional Neural Algorithm and the existing system WTA were run at different times in the google collab with a sample size of 24. From the table, it was observed that the mean accuracy of the Machine learning Algorithms like the Novel Convolutional Neural algorithms was 80.91% and the WTA was 69.88%. In order to compute the Mean, Standard Deviation, and Standard Error Mean, a T-test with an independent variable was performed among the research groups. With a value of 0.220 and an effect size of 1.612, the Novel Convolutional Neural Algorithm significantly outperforms the WTA. Table 2 represents the Mean of the Novel Convolutional Neural Algorithm which is better compared with the WTA with a standard deviation of 0.71499 and 0.63395 respectively. From the algorithm and WTA in terms of mean and accuracy. The mean results, the Novel Convolutional Neural algorithm (80.91%) gives better accuracy than the WTA (69.88%). Figure 1 gives the comparison chart of the Novel Convolutional Neural Algorithm accuracy of the algorithm is better than WTA. It is, therefore, conclusive that a novel convolutional neural network performs better than WTA. The resultant plots are shown below in the figure. The figure has been placed at the end of the paper.

4. Discussion

Novel Convolutional Neural Network and WTA algorithms are implemented and compared for Brust Prediction to improve the accuracy of cancer prediction ((Institute and National Cancer Institute 2020). From obtained results, it is concluded that the Novel Convolutional Neural algorithm provides better accuracy results c, compared to the WTA ((L.-L. Zhang et al. 2021). In the recent survey, the proposed NCNA is a promising option for predicting the future values of stocks with a root mean square value of 0.04 ((L.-L. Zhang et al. 2021; Shrihastini et al. 2021). proposed a semi-based model for different companies belonging to the banking sector based on historical data and observed that the error level comes down drastically with the data for longer periods ((Abdollahi et al. 2020). implemented six machine learning techniques ((M. and Krishnaveni 2020) i.e., Prophet, LR, SVM, Decision Tree, and Naive Bayes and by comparing them concluded that NCNA works better with an accuracy of 80% ((“Cancer Recognition in Medical Image Processing Using Watershed Algorithm” 2019). Major research contribution supports Implementation and comparative analysis of WTA to optimize prediction gain of drive with reduced efficiency improvement. Even though few articles listed the disadvantages of the proposed WTA. Further, the WTA is not suitable for improving the accuracy of Breast Cancer prediction ((Durst et al. 2019). From the above discussion, only a few articles ensure that they provide better performance than the proposed Novel Convolutional Neural Network and watershed transform algorithm for improving the accuracy of breast cancer prediction ((Hefnawy 2013; Boroujeni et al. 2020). Also, the present cancer prediction requires no additional cost and therefore received intense attention in recent years. So, we can infer that the proposed NCNA and WTA can be used to improve the accuracy of cancer disease prediction.

5. Conclusion

The work involves a Convolutional Neural Network(CNN) algorithm to find the breast cancer prediction to retrieval with reducing time to be proved with better accuracy of 80.90% when compared to watershed transform algorithm accuracy is 95.50% for predicting reducing time.

Declaration

Conflicts of interest

No conflicts of interest in this manuscript.

Author's Contributions

Author SV was involved in data collection, data analysis, and manuscript writing, Author SSA was involved in conceptualization, data validation, and critical review manuscript.

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6. References

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Tables and Figures

Table 1. Predicted Accuracy of Breast Cancer Prediction for 48 different sample sizes.

GROUP	Algorithms	Average accuracy
1	Convolutional Neural Network	80.90%
2	Watershed Transform Algorithm	69.88%

Table 2. Statistical analysis of Convolutional Neural Network and Watershed Transformation Algorithm. Mean accuracy, Standard deviation, and standard error values are obtained for 48 sample datasets.

	Algorithms	N	Mean	Std.Deviation	Std.Error Mean
Accuracy	Convolutional Neural Network	24	80.4479	.27329	.05578
	Watershed Transformation Algorithm	24	69.4958	.23976	.04894

Table 3. Independent sample T-test with a confidence interval at 95% and level of significance as 0.05. It shows the statistical significance of P<0.05 2-tailed.

	Levene's Test for Equality of Variances		T-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Differences	Std.Error Differences	95% Confidence Interval of the Differences Lower | Upper	
Equal Variances assumed	.593	.445	147.581	46	.000	10.95208	.07421	10.80271	11.10146
Equal Variances not assumed			147.581	45.234	.000	10.95208	.07421	10.80264	11.10153

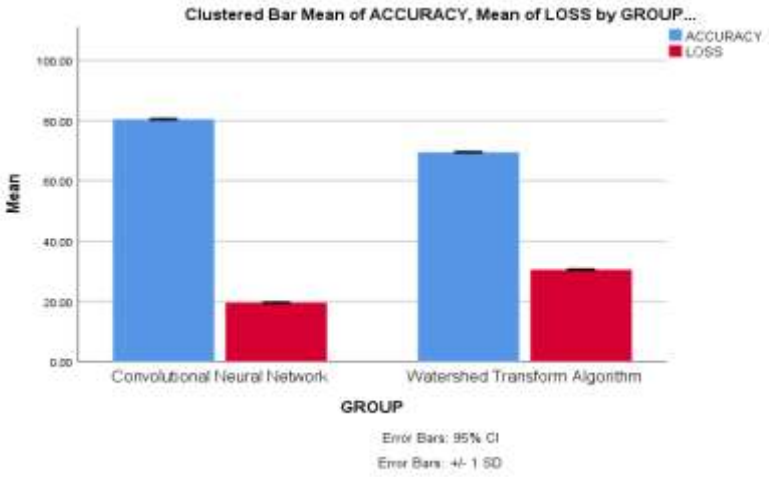

Fig. 1. Comparing the means and accuracy of a novel convolutional neural network and a watershed transformation algorithm. The mean accuracy of the Novel Convolutional Neural Network is better than the Watershed Transformation Algorithm. X-axis: Convolutional Neural Network vs Watershed Transform Y-axis algorithm: Mean accuracy. Error Bar ± 1SD.