Webology (ISSN: 1735-188X)
Volume 18, Number 6, 2021

Diagnosis Of Uterus Cervical Cancer Using MRI Images With Cnn Compared With ANFIS Approach

Dr. Rajasekaran.S[1] , Mrs. Hemalatha.B[2] , Dr .Neduncheliyan.S[3]

[1]Faculty of IT University of Technology and Applied Sciences-lbri Sultanate of Oman

[2,3] Department of ECE BIHER India

ABSTRACT

Earlier detection of cancer is spotted using an MRI scan. The Magnetic Resonance Imaging technique is used to look at the structures and organs present inside the body. Health care professionals use MRI scans for diagnosing torn ligaments to tumors. MRI scans offer good soft tissue contrast than CT. Many types of cancer cell formation like, breast cancer, bladder cancer, kidney cancer, colorectal cancer, oral and oropharyngeal cancer. The dreadful types of cancer is colorectal cancer Abnormal vaginal discharge means heavy or with a foul odor, pain during intercourse, pelvic pain, lower back pain, swelling and pain in legs, weight loss, and decreased appetite. Most of the women have a risk of cervical cancer. It will happenfor women over the age of 30. The primary objective of this research work is to confirm the formation of CC (Cervical cancer) in an earlier stage. MRI images are the input of the proposed system. It implements using the python programming language.

KEYWORDS Convolutional Neural Network(CNN), Cervical Cancer, MRI, Adaptive Neuro-Fuzzy Inference System(ANFIS).

INTRODUCTION

Cancer can begin in any part of the cell because of the accumulation of damage of genes. The difference is because of the exposure genes. The cancer-causing substance makes a difference because of exposure. The substance which causes cancer is called carcinogens. A carcinogen is a chemical material like some molecules in tobacco smoke. Cancer interferes with the cellular destruction and renewal method. Because of these interferences, the new cells increase abnormally, and the old cells will live when the body should destroy them. The new cells will be formed when there is no requirement for them. This excess cell can start to spread countlessly

without a control called developing tumor growth. Cancer is of four types namely, carcinomas, Sarcomas, Leukemia, Lymphomas. Skin or tissue will get affected because of Carcinomas then slowly it affects the internalglands and organs. Tissues will get affected first by Sarcomas that support and connect the body. Blood will get affected by Leukemia cancer.

Pap smear method is the best suitable standard testing for cervical cancer identification and detection. It is applied to the cervical images to identify the abnormal condition of the cells. But this manual method produces false-positive results also. Due to that reason, in this research work, CC is identified using CNN and ANFIS classifier. It implements using a python programming language.

II LITERATURE SURVEY

DL(Deep Learning) is the best choice for analyzing healthcare-related images, face identification, and feeling identification. Taye Girma Debelee et al., 2020 conducted a detailed survey about DL-based techniques implemented in breast cancer detection, cervical tumor, brain cancer, and cancers on the lungs. DL models apply to the images used in the breast and cervical tumors and images for brain cancer. The outcome of this review procedure pointed out the DL techniques are beneficial in cancer cell identification, segmentation, classification, and extracting features. The authors analyze the various DL methods used in the cancer identification area. The developed methods CNN model integrated with other models and it applies on hug dataset produces better results. Most of the researchers not concentrated on noise and damaged images. Usage of improved activation methods recommends increasing the whole outcome of DL methods in healthcare images. Many authors increase the layers with existing CNN layers to improve the system performance. Some people implemented on developing an exclusive framework for a particular task. Many techniques prove to create a better performance as related to the terms of sensitivity and specificity. The major demerit of the DL technique is insufficient dataset [1].

P. Sukumar et al., 2016 use a computer-based detection approach for identifying cervix cells using the existing Pap smear technique. It contains various stages like preprocessing, extracting features, region splitting, and categorization. Morphological techniques are applied to the images to split the nuclei region into the given cells. Attributes are extracted from the images by GLCM (Grey level co-occurrence matrix) wavelet and gray level methods. When abnormal cells identify, the concerned person arranges for biopsy screening and next-level surgery action. Extracted attributes classified with the help of ANFIS classifier. The proposed system attains better results in terms ofaccuracy, specificity, and sensitivity. The main intention of the proposed work is to stop the CC (Cervical Cancer) at an initial level [2].

The whole world is affected because of gynecologic issue in CC especially it is more affected in rural places and low healthcare condition places. Promoting the identification accuracy rate of CC, Miao Wu et al., 2018 tries to develop an innovative and effective categorization system for CC that depends on CNN with an easy framework compare with existing works. The proposed

model trains and tested using two kinds of datasets. The proposed scheme was convenient for categorizing CC cells from the given images, and it will assist the healthcare people in increasing the diagnosis rate. Here the authors collected the images from H & E tissue sector [3].

Due to CC, the female death rate increases in the whole world. But, these kinds of cancers are curable if it identifies in the initial stage. Pap smear is the most common testing method for CC identification. But this method is a hand-operated process, and it also produces a false positive rate due to human problems. Increasing the CC identification accuracy level computed based identification techniques based on DL design to categorize CC images automatically. MD MAMUNUR RAHAMAN et al., 2020 conducted a detailed survey and provided the study result-based DL system for cervical image analysis. Initially, the authors establish DL and its frameworks apply in this domain. Next, the authors illustrate public datasets and assessment features for categorization and segmentation processes. The authors presented the current DL models for categorization and segmentation of cervical images in the next stage. At last, they examined the previous techniques with relevant approaches for analyzing cancer cells. According to their research work, the authors suggested compound-type techniques can increase the performance of the classifiers. VGGnet, AlexNet, and Resnet are the common CNN frameworks used for extracting features in the specific domain [5].

Based on the WHO survey, many women are affected by the CC. The most common reason for this is lack of effective dealing. Beginning stage identification is essential in CC. It is one of the significant issues in CC identification. ML techniques are used in various healthcare applications and used to classify the cancer cells in the beginning stage. In the healthcare domain, ML approaches are suitable for predicting diseases in the early stage. Akshitha Shetty et al., 2018 reviewed various papers about ML techniques used to detect cancer cells. They compare the different approaches for detecting CC using healthcare data and illustrate the merits and demerits of the methods. In this research paper, the authors analyze various ML techniques used in healthcare with their accuracy rate. They also mentioned and highlighted the scope of DL methods in the CC prediction [7].

CC arises in the cervix cells of the uterus. Based on the WHO survey, C is the 4th common type of cancer disturbing women. Most of the deaths occur because of less number of healthcare professionals to handle CC screening. Most of the hospitals are not available to the facility for conducting screening tests. Automatic systems can forecast the CC level is needed for fast identification and better treatment. Ashutosh Kanitkar et al. 2019 presented ML techniques for detecting CC. Here the authors use demographic type data instead of image type data. They also introduced the comparison output of ten various ML approaches. Compared with other models, this model is detecting the CC at a low cost. Among the multiple techniques, the ANN model produces a better result. Also, this technique considers various parameters like women's education, menopause stage, and menstrual history for forecasting CC in women [9].

Ovaries are a significant component of the women's reproduction system. CC occurs due to various factors, but different techniques use to predict cancers. CNN is one of the standard techniques to predict the CC in an earlier stage. Mansi Mathur et al., 2020 explains about the CNN model how to categorize cancer in ovarian. They also explain different ML techniques such as KNN, SVM, and ANN used to predict cancer. After the comparison, the authors suggest DL methods are suitable for producing better results [11].

II PROPOSED SYSTEM

Cancer is the name given to the collection of related diseases. In most cases, the body's cells start to divide without any stops, and it also spreads fastly, and it also spreads to the surrounding tissue. Cervical Cancer is the type of cancer that will appear in the cells present in the cervix, the lower part of the uterus connected to the vagina. Fig 1 illustrates the different stages of the proposed system.

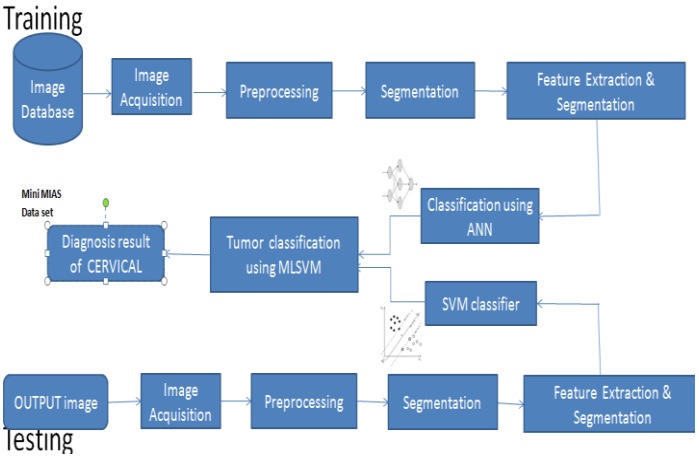

Fig. 1 Proposed Work Flow Diagram

The research work consists of various steps. The following paragraph brief the multiple steps.

Preprocessing

The main intention of the research work is to reduce the time needed for classification. Direct MRI images are taken more time for classification. To reduce the processing time, preprocess technique applies to the given images. In this stage, given MRI images are converted into gray-level images.

Segmentation

In this stage, the preprocessed images segments into subparts. It reduces the image complexity level and is also used to analyze the images most easily.

Feature Extraction

In this step, the significant features are extracted from the segmented images. These extracted features use to distinguish affected and not affected cells from the given segmented image. In this research work, LBP(Local Binary Pattern) technique uses to extract the desired features.

CNN

It assigns preference or various objects in the image and be able to differentiate one from another. CNN is helpful for image classification and recognition because of its better accuracy level. The CNN is structure has two layers: the feature extraction layer and the feature map layer.

ANFIS

It is a sort of AI network procedure used to demonstrate and control ill-defined and dubious frameworks. ANFIS model executes dependent on the input or outputinformation sets of the framework.Using the ANFIS function for input data and passes to the training data input argument while using neuro-fuzzy designers, select training and select the file and workspace in the load data section.

IV RESULT AND DISCUSSION

ANFIS follows a hierarchical model that works on forming a network, likely a funnel, and as a result, it gives out a fully connected and the outcomes are processed. For efficientpattern recognition and image processing CNN recognition algorithm is used. ANFIS algorithm includes an adaptive Artificial Neural Network and a fuzzy inference system to utilize a hybrid learning rule merging gradient descent backpropagation and least square algorithm.To estimate a large class of complex nonlinear system the above algorithm can be used to find the mathematical structure.

Now let us see the see how the uterus cancer is been segmented and classified by our proposed ANFIS. The input original and modified images is been collected from the online datasets. Then this image is fed into the program. At first the image will be Resized and converted into black and white image according to the program and the noise present inside the image is been analyzed and removed by median filter. Then segmentation is done by using clustering algorithm Fuzzy C and classification is processed using ANFIS.

The input image is shown in fig 2 and the black and white image is shown in fig 3 represents. Fig 4 represents the binary image and fig 5 represents clustering process. Then fig 6 represents the segmentation process in which the uterus cancer is been detected by ANFIS and fig 7 represents the current stage of cancer. The last fig 8 represents the comparison graph between CNN and ANFIS algorithms.

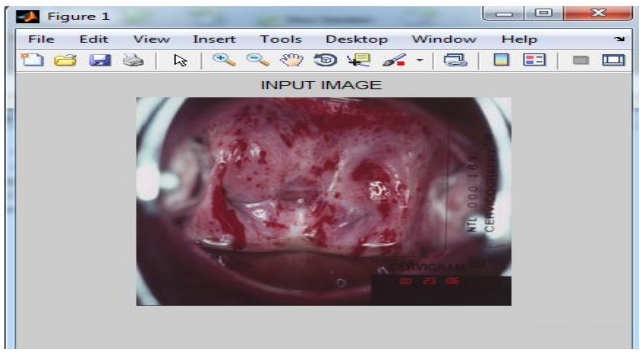

Fig.2 Input Image

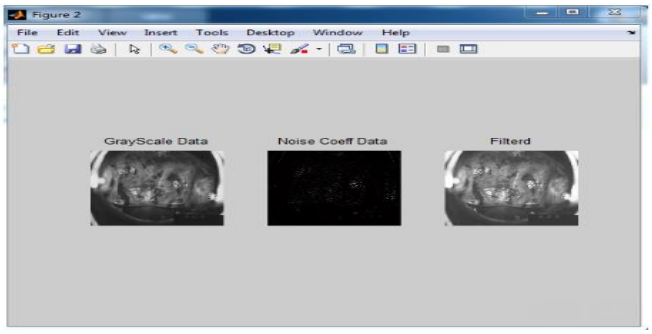

Fig.3 Grey Scale Image

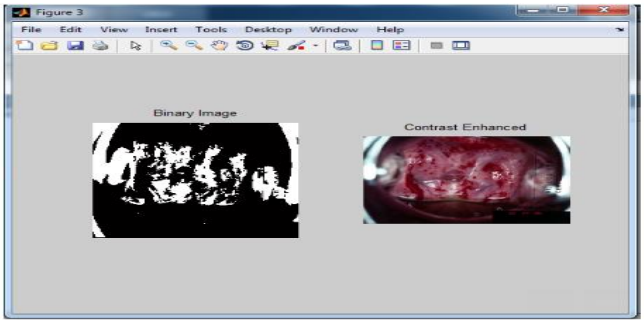

Fig.4 Binary Image

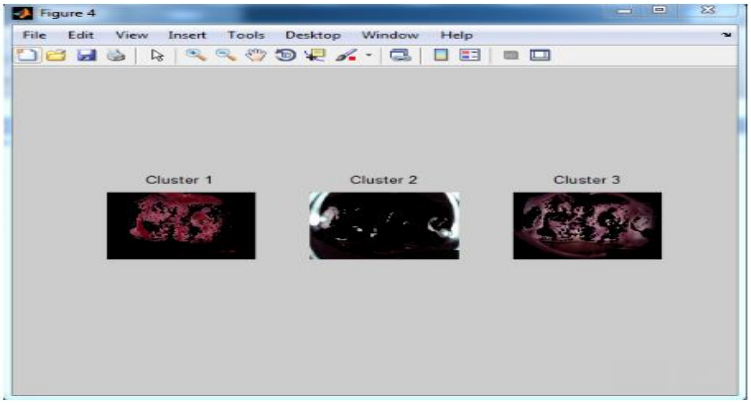

Fig.5 Clustering Process

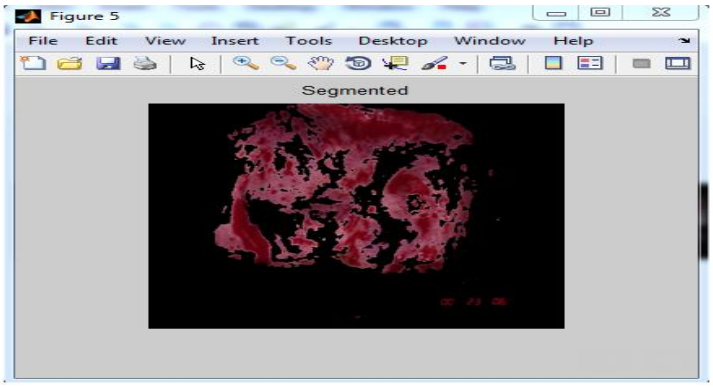

Fig.6 Segmented Image

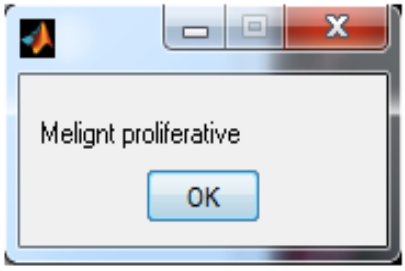

Fig.7 Classification

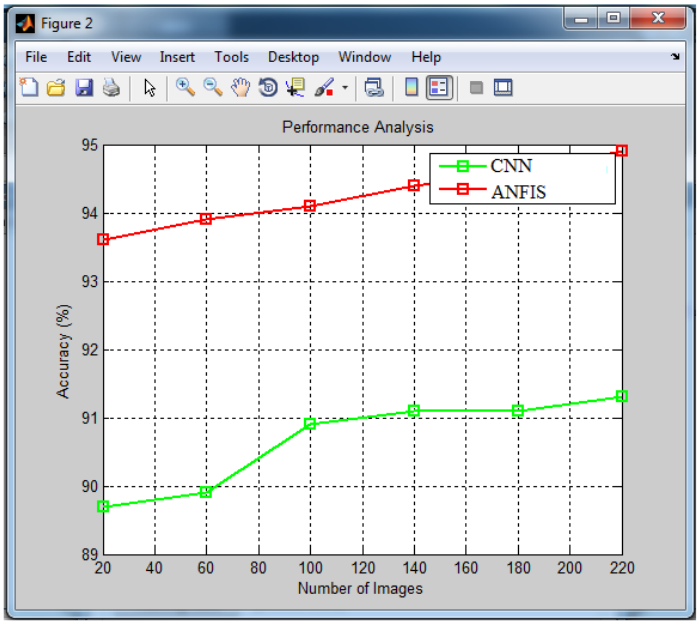

Fig.8 Comparison Graph

V CONCLUSION

Most of the people who are affected by cancer don't have any earlier symptoms. But the earlier detection of cancer is much better to safeguard the person from being critical situation. If this cancer is not diagnosed and treated in earlier stage cervical cancer can spread to every part of the body and it becomes deadly.CNN and ANFIS classifiers use to identify the cancer cells in MRI images.It assists the healthcare professionals in forecasting the CC in an earlier manner.

REFERENCES

[1] Taye Girma Debelee, Samuel Rahimeto Kebede, Friedhelm Schwenker& Zemene Matewos Shewarega(2020), "Deep Learning in Selected Cancers' Image Analysis—A Survey", MDPI Journal of Imaging, 6, 121, pp. 1-40.

[2] P. Sukumar& R. K. Gnanamurthy(2016), “Computer Aided Detection of Cervical Cancer Using Pap Smear Images Based on Adaptive Neuro-Fuzzy Inference System Classifier", Journal of Medical Imaging and Health Informatics Vol. 6, 1–8, 2016.

[3] Miao Wu, Chuanbo Yan, Huiqiang Liu, Qian Liu,& Yi Yin(2010), “Automatic classification of cervical cancer from cytological images by using convolutional neural network”, “, Bioscience Reports, v.38(6); 2018 Dec 21, PMC6259017.

[4] S. Leena Nesamani, S. Nirmala Sugirtha Rajini, M. S. Josphine & J. Jacinth Salome(2021), “Deep Learning-Based Mammogram Classification for Breast Cancer Diagnosis Using Multi-level Support Vector Machine”, Springer Lecture Notes in Electrical Engineering, vol. 700, pp. 371-383

[5] MD MAMUNUR RAHAMAN , CHEN LI , XIANGCHEN WU , YUDONG YAO, ZHIJIE HU , TAO JIANG, XIAOYAN LI , AND SHOULIANG QI (2020), "A Survey for Cervical Cytopathology Image Analysis Using Deep Learning”, IEEE Access, Vol. 8, pp. 61687-61710.

[6] B. Bavani, S. Nirmala Sugirtha Rajini, M.S. Josephine & V. Prasannakumari(2019), “Heart Disease Prediction System based on Decision Tree Classifier”, Jour of Adv Research in Dynamical & Control Systems, Vol. 11, 10-Special Issue.

[7] Akshitha Shetty, Vrushika Shah(2017), “Survey of cervical cancer Prediction using Machine Learning: A comparative approach”, IEEE 2018 9th International Conference on Computing, Communication and Networking Technologies (ICCCNT), pp. 1-6.

[8] Leena Nesamani S & Nirmala Sugirtha Rajini. S(2020), “Evaluation of Ensemble Machines in Breast Cancer Prediction”, Advances in Parallel Computing, Vol 37, pp. 391-395.

[9] Ashutosh Kanitkar, Varun Joshi, Yash Karwa, Sanjyot Gindi & Dr. G. V. Kale(2019), “Comparison of Machine Learning Algorithms for Cervical Abnormality Detection”, IEEE 2019 Twelfth International Conference on Contemporary Computing (IC3), pp. 1-6.

[10] FATMA NEWAGY(2016), " Global Energy-Efficiency Metric for Coordinated Cognitive Radio Networks ", IEEE Access, Vol. 4, pp. 6733-6738.

[11] Mansi Mathur; Vikas Jindal; Gitanjali Wadhwa(2020), "Detecting Malignancy of Ovarian Tumour using Convolutional Neural Network: A Review", Sixth International Conference on Parallel, Distributed and Grid Computing (PDGC), pp. 351-356.