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Lung Cancer Detection Using Deep Convolutional Neural Network

Aditi Kulkarni[1], Kavita Jadhav[2], Arshit Mishra[3] Anand Kumar[4]

[1,3,4]Student Dept. of E&TC, SKNCOE ,SPPU ,Pune, India

[2] Assistant Professor, Dept. of E& TC, SKNCOE ,SPPU, Pune, India

[1]kulkarniaditic @gmail.com
[2]kavita.jadhav_skncoe@sinhgad.edu
[3]arshit23@gmail.com
[4]anand2909kr@gmail.com

Abstract

Lung cancer is one of the significant cause of death across the globe. Early detection is necessary for reducing the risk of death. A computer aided diagnosis (CADx) system uses CT scan images with help of convolution neural network. Over last 10 years the survival rate has been increased to 17.8% due to early age detection. Digital image processing (DIP) are carried using MATLAB . Median filtering is an image processing technique is used to improving the contrast in the image and remove noise. Input data sets are provided to and used in differentiate between the aspects of the image. It is used to reduce the image in the form easier to process without losing any feature so that we can get good predications. By comparing with data sets and input image we can get to know if lung is cancerous or noncancerous.

Keywords—*Lung cancer, Median Filter, CNN, Linear classification, Early detection*

I. INTRODUCTION

Cancer may be a group of diseases characterized by the uncontrolled growth and spread of abnormal cells. If the spread isn't controlled, it may result in death. Lung Cancer is one of the common among men and women across the globe. 85% of the total is due to smoking and consumption of tobacco and remaining due to occupational and environmental exposure like asbestos, certain organic chemical, air pollution etc. From 2005 to 2015, lung cancer incidence rates decreased by 2.5% per year in men and 1.2% per year in women. Symptoms don't usually occur until the cancer is advanced, and should include persistent cough, sputum streaked with C blood, pain, voice change. Image Processing may be a method to convert a picture into digital form and perform some operations there on, so as to urge an enhanced image or to extract some useful information from it. It includes acquiring images, its segmentation and processing. In Image Processing, the RGB images will be converted to gray scale and binary. Images will be enhanced and noise will be removed using filters. Blurred effect will be eliminated if any. This improves the quality of input image The Image Processing Toolbox in MATLAB is used to perform the Image Processing stages. Many different algorithms are possible for each stage in image processing. Deep Learning is used

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for the classification of CT Scan Images as cancerous/non-cancerous. The process of feature extraction in Convolution Neural Networks.

Motivation

Medical imaging is a fundamental aspect of modern healthcare and plays an important role in cancer diagnosis and post-treatment monitoring. Medical images encode visual features which represent cancer phenotypic characteristics such as cancer location, size, texture and shape, which are useful for disease diagnosis and oncologic research. Furthermore, the growing quantity and quality of medical images allow the creation of big data-driven approaches to computer-aided diagnosis (CAD, where clinicians routinely utilize CAD tools such as segmentation and registration to aid in their interpretation and decision making, as well as automated detection and classification of diseases as the second opinion to improve diagnostic accuracy's.

II.LITERATURE SURVEY

Various optimization algorithms are evaluated to detect the tumor. Before being subjected to statistical analysis preprocessing is needed for medical images. The adaptive median lter has better results than median and mean lters because the speckle suppression index and speckle and mean preservation index values are lower for the adaptive median lter. Comparing the algorithms, the accuracy of the tumor extraction is improved in GCPSO with the highest accuracy of 95.8079%, and it obtained above 90% of precision altogether the 20 images. When it is compared to the previous techniques where the accuracy was 90% in 5 out of 10 different dataset, this proposed technique was more accurate. Infuture studies, the use of more number of optimization algorithms will be included to improve the accuracy [1].

A total of 910 images were taken from LIDC as the dataset for the implementation. 257 images were labeled normal, 331 as beningn and 322 as malignant. 210 images of each class were pre-processed and trained in the CNN network. The remaining images were untrained and tested to get results. A total of 281 images, 47 images of normal, 121 images of beningn and 113 images of malignant class were tested. A accuracy is calculated using confusion matrix[2].

The most immediate future work is touse Water shed segmentation as the initial lung segmentation. Other opportunities for improvement include making the network deeper, and more extensive hyper parameter tuning. Also, we save dour model parameters at best validation AUC, but perhaps we could have saved at other metrics, such as F1. Other future work include extending our models to 3D images for other cancers. The advantage of not requiring too much labeled data specific to our cancer is it could make it generalizable to other cancers. [3].

Study draws attention to the early diagnosis of lung cancer. Lung nodule classification is benign and malignant. Deep learning architecture CNN isespecially known for its success in image classification. For biomedical image classification operation, it also obtains successful results. 3D CNN architecture is used for classification in the study. Experimental results show that the method is successful, although the images in the data set used are rather small. In the future, the performance of the system can be improved with a larger dataset and an improved architecture [4]

Image-based computer-aided diagnosis (CADx) algorithm by use of convolutional neural

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network(CNN) does not necessarily require an image-feature extractor. Therefore, image-based CADx is powerful compared with feature based CADx that requires the image-feature extractor for differential diagnosis of lung abnormalities such as lung nodules and diffuse lung diseases. We have also developed an image-based computer-aided detection(CADe) algorithm by use of regions with CNN features (R-CNN) for detection of lung abnormalities [5]

Universal Binary Neurons Cellular Neural Networks (UBNCNN) end ocardialedge detection is proposed. The echo cardiographic image is preprocessed to enhance the contrast and smoothness by utilizing Multi Valued Neural Cellular Neural Networks (MVN-CNN) nonlinear filter. UBNCN is applied to the smoothed image to extract the heart boundaries. A non-threshold Boolean function withn in evariables is utilized to detect the edges corresponding to the upward and downward brightness overleaps. Some experimental results are given for different echocardiographic images. The combination Of MVN-CNN and UBN-CNN approach showed better results for extracting the LV endocardial boundaries [6].

III.METHODOLOGY

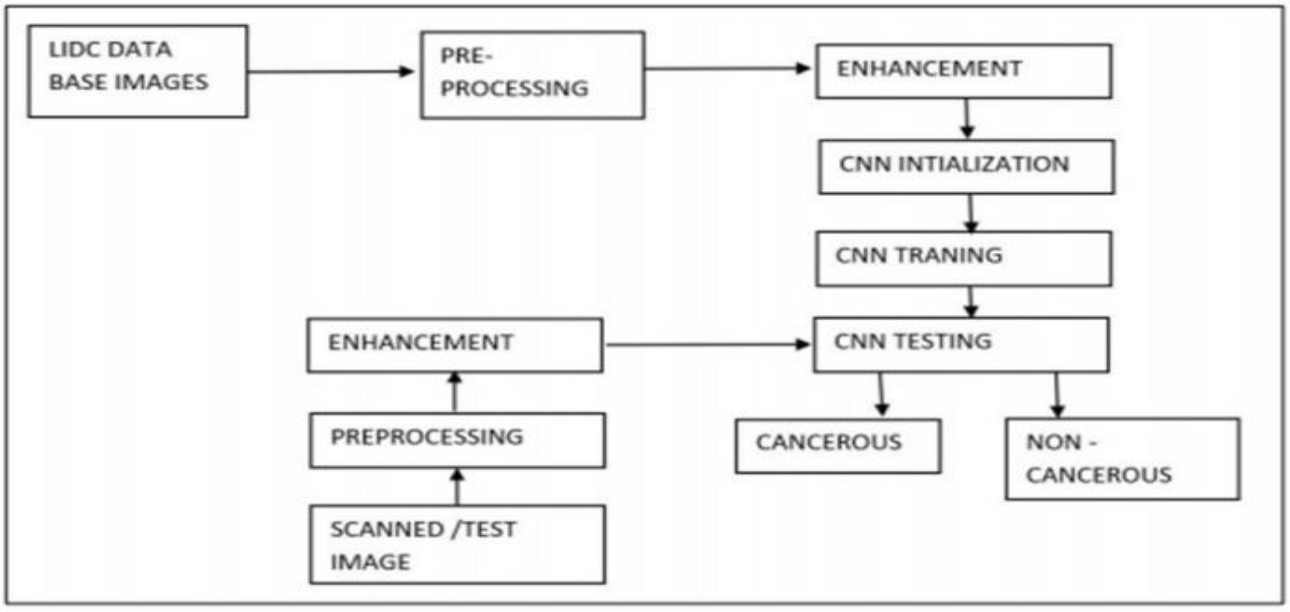

Fig 1: System Architecture

We have used and obtained dataset from a Lung Image Database Consortium (LIDC) for training. These dataset has various CT scans of both large as well as little tumors , these are saved in DICOM (Digital Imaging and Communications in Medicine) format. . In pre-processing stage the image is converted from RGB to Gray Scale image. The image resizing is done in the same Stage. By using Adaptive Median Filter Enhancement of the image is done. CNN is initialized and training of image does the Classification of the cancerous and non - cancerous images. Dataset for training is obtained from Lung Image Database Consortium (LIDC) and Image Database Resource Initiative (IDRI). LIDC and IDRI consist of 1000 CT scans of both large and small tumors saved in Digital Imaging and Communications in Medicine (DICOM) format

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CNN: An artificial neural network is an interconnected group of nodes, inspired by a simplification of neurons in a brain. Here, each circular node represents an artificial neuron and an arrow represents a connection from the output of one artificial neuron to the input of another. There are various steps involved in CNN algorithm such as: - Convolution Operation, Pooling, Flattening and Full Connection.

IV.RESULTS AND DISCUSSION

The neural network based on convolutional and watershed segmentation has been implemented in MATLAB and the sample data of lung image is trained to understand and familiarize the lung cancer. A sample image has been fed as an input to the trained model and therefore the model at this stage is in a position to inform the presence of cancer and locate the cancer spot in the sample image of a lung cancer. The process involves the feeding the input image, pre-processing, feature extraction, identifying the cancer spot and indicate the results to the user. In case of the malignancy is present, a message indicating the presence of will be displayed on the screen along with the given input image as shown in figure 4.4

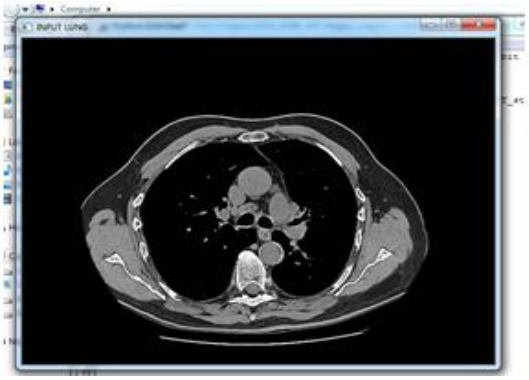

Fig.2 Input Image of Lung

Fig.3 Resized Image

Fig.4 Enhanced Image

Fig.5 Result Display

V. CONCLUSIONS

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This study draws attention to the early diagnosis of lung cancer. Lung nodule classification is benign and malignant. Deep learning architecture CNN is particularly known for its success in image classification. We have received successful results for biomedical image classification operation. CNN architecture is employed for classification within the study. Experimental results show that the tactic is successful, although the pictures within the data set used are rather small. In the future, the performance of the system are often improved with a bigger dataset and an improved architecture.

REFERENCES

[1] Anita Chaudhary, Sonit Sukhraj Singh "Lung cancer detection on CT images using image processing", is computing sciences 2012 international conference, IEEE, 2012.
[2] D. Nurtiyasari, and R. Dedi, "The application of Wavelet Recurrent Neural Network for lung cancer classification," Science and Technology-Computer (ICST), 2017 3rd International Conference on. IEEE, 2017.
[3] E. Dandıl, M. Çakiroğlu, Z. Ekşi, M. Özkan, Ö. K. Kurt, and A. Canan, "Artificial neural network-based classification system for lung nodules on computed tomography scans," in 6th International Conference of Soft Computing and Pattern Recognition (soCPar), pp. 382– 386, IEEE, 2014.
[4] J. Cabrera, D. Abigaile and S. Geoffrey, "Lung cancer classification tool using microarray data and support vector machines," Information, Intelligence, Systems and Applications (IISA), 2015 6th International Conference on. IEEE, 2015.
[5] H. M. Orozco and O. O. V. Villegas, "Lung nodule classification in CT thorax images using support vector machines," in 12th Mexican International Conference on Artificial Intelligence, pp. 277–283, IEEE, 2013.
[6] H. Krewer, B. Geiger, L. O. Hall et al., "Effect of texture features in computer aided diagnosis of pulmonary nodules in low dose computed tomography," in Proceedings of the IEEE InternationalnConference on Systems, Man, and Cybernetics (SMC),2013, pp. 3887–3891, IEEE, Manchester, United Kingdom,2013.
[7] M. Abadi, P. Barham, J. Chen, Z. Chen, A.Davis, J. Dean, M.cDevin, S. Ghemawat, G. Irving, M. Isard, M. Kudlur, "TensorFlow: A System for Large-Scale Machine Learning," InOSDI 2016 Nov 2 (Vol. 16, pp. 265-283).
[8] Arvind Kumar Tiwari, "Prediction Of Lung Cancer Using Image Processing Techniques", Advanced Computational Intelligence: An International Journal (Acii), Vol.3, No.1, January 2016.
[9] RuchitaTekade ; K. Rajeswari, "Lung Cancer Detection and Classification Using Deep Learning", Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), Aug. 2018.
[10] K. Senthil Kumar, K.Venkatalakshmi, K. Karthikeyan, "Lung Cancer Detection Using Image Segmentation by means of Various Evolutionary Algorithms", Computational and Mathematical Methods in Medicine, Jan 2019.
[11] Q. Song, L. Zhao, X. Luo, and X. Dou, " Using deep learning for classification of lung nodules on computed tomography images", Journal of Healthcare Engineering, 2017
[12] A. Asuntha, N. Singh, and A. Srinivasan, "PSO, genetic optimization and SVM algorithm used for lung cancer detection," Journal of Chemical and Pharmaceutical Research,2016.

ISSN: 2233-7857 IJFGCN

[13] A.A.Brindha, S.Indirani, and A.Srinivasan, “Lung cancer detection using SVM algorithm and optimization techniques,” Journal of Chemical and Pharmaceutical Sciences 2016.
[14] Albert Chon, Niranjan Balachandar ,“Deep Convolutional Neural Networks for Lung Cancer Detection”, Computer Science, Published 2017.

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