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Pi Based Lung Cancer Detection using Deep Learning Technique

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***Abstract*— Prediction of lung cancer is most challenging problem due to structure of cancer cell, where most of the cells are overlapped each other. The image processing techniques are mostly used for prediction of lung cancer and also for early detection and treatment tp prevent the lung cancer. To predict the lung cancer various features are extracted form the images therefore, Neural network based approaches are useful to predict the lung cancer. Recently, image processing techniques are widely used in several medical areas especially in various cancer tumors such as, lung cancer, breast cancer etc. Image quality and accuracy are the core factors of this research, image quality assessment as well as improvement are depending on the enhancement stage where low pre processing is used based on filter. Since in this research detect lung cancer using raspberry pi the process like segmentation, pre processing, extraction and detection are all done within raspberry pi. Following the segmentation principles and enhanced region of the object of the interest is used as a basic foundation of feature extraction is obtained. Relying on general features, a normality comparison is made. The summary for prediction of lung cancer by previous researcher using image processing techniques is also presented.**

***Keywords*—Lung cancer; Segmentation; image processing; Feature extraction**

I. INTRODUCTION

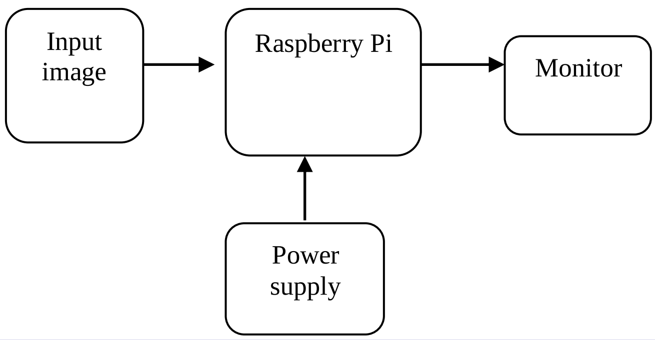
Lung cancer, also called as carcinoma of the lungs is caused due to the uncontrolled growth of cells in the tissues of the lung. Most of the cases of the lung cancer is due to smaoking. The treatment of this deadly disease and its outcomes depends on the type of cancer, stage (i.e.) degree of spread and person's overall health performance. The exhaled breathe contains over 250 chemical entities including Nitric Oxide, carbon monoxide and volatile organic compounds. Measurement of VOCs in the gaseous phase of exhaled breathe has become an area of increasing research including in lung cancer. Some are now in early clinical development. Other adaptations of the VOC methods include solid phase micro extraction (SPME) which is a virtual array of surface acoustic wave (SAW) gas sensors with an imaging recognition technique. Possible bio markers indicative of pulmonary carcinogenesis.

II. LITERATURE SURVEY

Adam Huang et.al observed that original CT performed better with higher sensitive rates while the 2D projection images tendered to have better specificity rates. Combining the volume visualisation with 2D CNNs is a promising approach for improving large nodules and masses detection for lung CT data cells. Mario coccia et.al proposed that deep learning has the opportunity t o assist the pathogists and physicians by improving the efficiency of their work, standardizing quality and providing better prognostication. The study here suggest that deep learning technology in oncology can pave a revolution in the management cancer based on new and effective diagnostic approaches in clinical practice to support appropriate anti cancer treatment. Gur Amrit Paul Singh et.al proposed that they have applied image processing and machine learning approaches for detection and classification of lung cancer. The techniques have been categorised and implemented in 5 different stages known as image acquisition , image pre processing and segmentation, feature extraction that gives better results in detecting lung cancer nodules. Rohit Y. Bhalerao et. Al demonstrated that bio medical image processing is the latest emerging tool in medical research for the early detection of cancers. Lung image data base consortium (LIDC) is used as input date for image processing. After image processing, the input images become ore efficient and refined. These are input for the CNN filtering. Rahib H. Abiyev et.al analysed convolutional neural network (CNN) is designed for chest diseases. For comparative analysis back propogation neural network (VPNN) and competitive neural network (CPNN) are carried out for the classification of lung cancer diseases. The designed CNN, BPNN and CPNN are trained and tested using the chest X ray images containing tumours.

III. PROPOSED METHODOLOGY

Our proposed system is to detect lung cancer using CNN. CNN stands for Convolution Neural Networks. Our Proposed system is to detect lung cancer using CNN in embedded systems. In the 1st stage, lung regions are extracted from CT image and are given as input to Raspberry Pi. In that part each slices are segmented to get tumors. The segmented tumors regions are used to test the patient images. The main objective of this study is to detect whether the tumors present in a patient's lung is malignant or benign. The below figure shows the block diagram of the proposed system. As shown in the figure, the trained system will able to detect the cancerous presence in lung CT.



A. *Process in Raspberry pi*

The Raspberry Pi is a single computer board with credit card size, that can be used for many tasks that your computer does, likes games, word processing, spreadsheets etc. Raspberry Pi can be used as a desktop computer the heart of a media center and other applications. In this paper when the input images and data sets are given, the pre processing and the comparison are done with CNN methodology. When they display the required output (detecting lung cancer) in the monitor

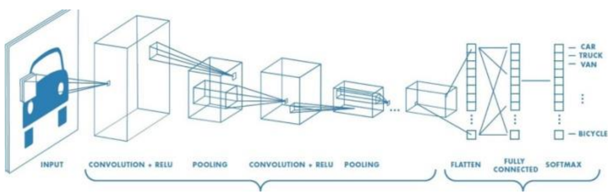
B. *Convolution neural network*

A CNN is type of a DNN consist of multiple hidden layers such as convolutional layer, RELU layer, Pooling layer and fully connected a normalized layer.CNN shares in the convolutional layer reducing the memory footprint and increases the performance of the network. The important features of CNN lie with the 3D volumes of neurons, local connectivity and shared weights. A feature map is produced by convolution layer through convolution of different sub regions of the input image with a learned kernel. Then,a non linear activation function is applied through ReLu layer to improve the convergence properties.

In CNN architecture usually convolution layer and pool layer are used in some combination.The pooling layer usually carries out two types of operation viz, max pooling and means pooling. Mean pooling reduces the error caused by the neighborhood size limitation and retains background information.Max pooling reduces the convolution layer parameter estimated error caused by the mean deviation and hence retains more texture information

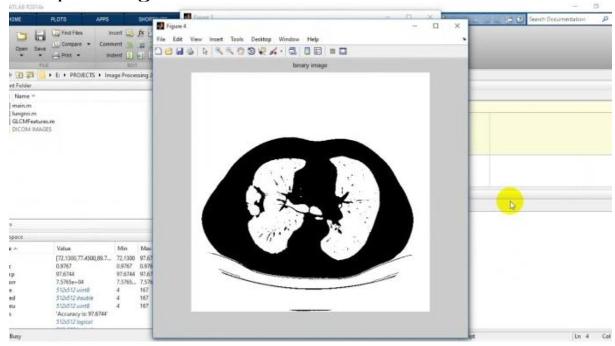
C. *Architecture of CNN*

The input to a convolutional layer is an image of size m x m x r,where r is the number of channels,there are k filter kernels of size n x n x q where n < m,q <= r and may vary for each kernel in convolutional layer,which are convolved with the input image to produce k feature maps.Each map is then subsampled with mean or max pooling over p x p contiguous region (p -ranges from 2 to 5)and an additive bias and sigmoidal nonlinearity is applied before or after the sub sampling layer



IV. RESULTS

The neural network based on convolution has beenn implemented in PYTHON and the system is trained with sample data set for the model to understand and familiarize the lung cancer. A sample image has been fed as an input to the trained model and the model at this stage is able to tell the presence of cancer and locate the cancer spot in the sample image of a lung cancer. The process involves the feeding input image to the raspberry kit and display the out in the screen. 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



V. CONCLUSION

A CNN based system was implemented to detect the cancer tissues present in the input lung CT image.Lung image with different shape,size of the cancerous tissue has been fed at the input for training the system.the proposed system is able to detect the presence and absence of cancer cells with accuracy of about 96%.The accuracy of lung cancer detection with the proposed CNN based method was compared

Authors	**sensitivity**	**specificity**
Albrt Chon.et.al	43%	85%
Devi Nutiyasari.et.al	86.30%	87%
proposed method	91%	95%

In this proposed work the specificity obtained is 95% wich shows that there is no false positive detection.Also the accuracy,sensitivity and specificity of the proposed system is high when compared to the previously available CNN based systems.

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