Lung Cancer Detection Using 3D Convolution Neural Network (CNN)

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***Abstract*: Lung cancer is one of the most deathful disease in the world. The detection of the lung cancer in the early stage is challenging one. Early detection is the best chance to recovery. The paper represents an approach which utilize a 3D Convolution Neural Network (CNN) to determine the whether a person as cancer or not. The accuracy obtained by means of 3D-CNN is 95%, when compare to the traditional neural network system which is more efficient.**

I. INTRODUCTION

Lung cancer is one of the most deathful disease in the world. It affects roughly about 9.6 million peoples every year [1]. Around 63,000 peoples die to Lung cancer every year [1]. Early detection of lung cancer is done by using many imaging techniques such as Computed tomography (CT), Chest X-ray Magnetic Resonance Imaging (MRI).

II. PROPOSED METHODOLOGY

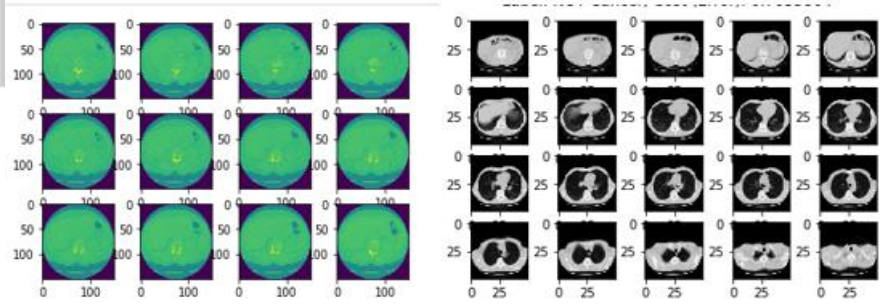
This paper represents lung cancer detection based on CT chest images in DICOM format using 3D CNN. Before feeding the image into 3D CNN we are doing preprocessing. Then the preprocessed model is feed into 3D CNN to classify the CT scans as positive or negative to achieve the result.

III. DATASET

The dataset consists of over a thousand low-dose CT images from high risked patients in DICOM format. Every image contains a series with multiple axil slices of the chest cavity. The all DICOM files contains a header that have the required information about the patient id, also as scan parameters like the thickness of the slices.

IV. PREPROCESSING

The Computed Tomography (CT) scan images not containing the lungs only, it also surrounded by other substance such as tissues, bones, air, blood and water. This is not important. It affects the model characterizes the nodules and the detecting performance and accuracy. Few anomalies that potentially cause for the data pre-processing for example irregular size in the x and y axis of the image, depth is dependent on number of axial file available in the folder, sometimes it was same and sometimes it was different. Some tedious procedures are taken to merge the individual slices into 3D images then feed into convolution neural network.



Raw image Preprocess image

V. DEEP LEARNING

Deep learning composed of several layers such as nonlinear nodes, combining input with a set of weights so that assigning significance to the input for the corresponding task the algorithm is attempting to learn in supervised or supervised behaviour. The sum of product of these input and weight is passed through the activation function of the nodes [2].

VI. 3D CONVOLUTION NEURAL NETWORK

The 3D CNN architecture consists of input, convolutional, pooling and fully-connected layers.

Convolutional Layer

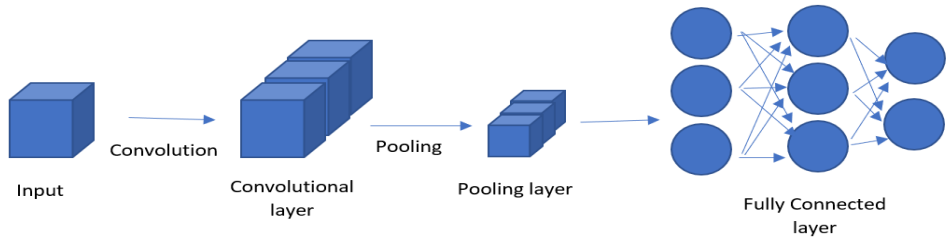
In this layer the images are translated into feature-map data by convolutional kernels or filters. The kernels move through the 3D data (height, length and depth) and produce 3D maps.

Pooling Layer

Down-sampling or pooling is done on the output of the convolutional layer. The ultimate goal of the pooling layer is to progressively reduce the spatial size of the matrix and to reduced the number of parameters to control over fitting.

Fully-connected Layer

The output of the pooling layer is used in fully connected layer. The goal of the fully connected layer is to classify the image into label. The softmax function is used to get probabilities as it pushes the values as between the 0 and 1.



VII. TRAINING

This section involved in using to determine the accuracy of the model, to predict whether a person could be affected with cancer or not. When the model is training, I send 80% of data and keep 20% rest for validation purpose to check is the model is well trained or not.

The no of epochs, batch size and image input size are specified. The image input size is 50x50x20 it is very small compare to the original image size. After running 100 epochs, the percentage of the accuracy was stagnant it around 80%

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VIII. TESTING AND OUTPUT

In testing confusion matrix is used, the confusion matrix is determined whether the model is good or bad. The 0 represent the patient has no cancer and the 1 represents the patient has cancer. Preferably the false positives and the false negative should be low.

IX. CONCLUTION AND FUTURE EXTRACTION

In this paper, 3D CNN classifier is used to determine whether a CT lung image as cancer or not. Before using 3D CNN, we preprocessed the image through the thresholding techniques. Then the accuracy of the model is 80%, the accuracy is better than existing methods.

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