IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⋇ Impact Factor 7.12 ⋇ Vol. 10, Issue 2, February 2023

DOI: 10.17148/IARJSET.2023.10218

A TWO-STAGE CONVOLUTIONAL NEURAL NETWORK FOR LUNG NODULE DETECTION

Prof. Somasekhar T[1], KavyaShree S L[2], Priyanka R[3], Ranjitha D V[4], Thriveni U[5]

Professor, CSE, KSIT, Bangalore, India[1]

Student, CSE, KSIT, Bangalore, India[2-5]

Abstract: A malignant tumor with quick development and early metastatic dissemination is known as small-cell lung cancer (SCLC). Improved survival depends on early and accurate SCLC diagnosis. Accurate cancer segmentation helps medical professionals better comprehend the location and scope of cancers and make more accurate diagnoses. The YOLO framework is being utilized in this effort to both locate and categorize a lung tumor that is connected to the edge of blood vessels. The R-CNN methods presented in Part 1 mainly employ regions to localise objects within images. The network only looks at the areas ofthe image that are most likely to contain an item, not the complete picture. The biggest benefit of employing YOLO is how quick and precise it is.

Keywords: Convolutional Neural Network, Image Processing, Pooling, Median

I. INTRODUCTION

The lungs resemble two sponge cones on the outside. While the right lung has three lobes, the left has two. The right lung is substantially larger than the left one. Inhalation delivers oxygen to the lungs. Oxygen is introduced into the circulation by lung tissue. Small cell lung cancer and non-small cell lung cancer are the two primary subtypes of lung cancer, respectively, with carcinoma, adenocarcinoma, and squamous cell carcinoma being its three subtypes. Image processing in medicine has a variety of applications, including the detection of lung cancer. The proposed system description for the diagnosis of lung cancer has four basic stages In the initial stage, a number of CT images from the IMBA Home Database are utilised. These pictures can either be abnormal or normal (via ELCAP Public Access).

The second stage employs a number of picture enhancement techniques to produce the best level of quality and clarity. The third stage of image processing employs picture division methods, which are essential for the phases that follow Enhanced partitioned images are employed in the fourth stage to extract generic features that serve as indicators of an image's normalcy or abnormality. Patients with stage 1 lung cancer are said to have a better prognosis than those with more advanced disease. CT scan images are classified as malignant or non-cancerous using deep learning. The algorithm examines the features and patterns in the input data and, for training data, creates a set of parameters and feature extraction with related permutations. By giving a common value to a collection of matrix pixels, the convolution filter will create a spatially dense output. These values determine the image's output .

II. RELATED WORK

1. Using Methodology Classification Based on Deep Learning, Effectively Identifying Lung Cancer on Computed Tomography Images

Deep learning is an AI characteristic that imitates how the human brain learns for higher cognitive processes including object detection, speech recognition, language translation, and object detection. In recent years, it has become essential to forecast cancer at an earlier stage in order to increase the likelihood that the patient would survive. The most terrible variety is lung cancer, which is one of the most common diseases affecting people globally.

2. Deep Learning Network for Lung Cancer Detection

A Comparative Analysis An influential and emerging technique for feature learning and pattern identification is deep learning. In our study, we contrast the classic Computer-Aided Diagnosis scheme with the Deep Learning Technique Computer-Aided Diagnosis scheme. In this research, we compare a number of deep neural networks for lung cancer detection.

DOI: 10.17148/IARJSET.2023.10218

3. Convolutional Neural Network for Lung Cancer Detection

The leading cause of cancer-related deaths worldwide is lung cancer. The patient will be saved if lung cancer is found. The CNN, a method that effectively describes a deep learning model with a filter that can be trained by incorporating alternate local pooling operations on input CT images, produces a variety of hierarchical complicated characteristics. This study describe a method for classifying lung cancer or normal tissue seen during computed tomography images for screening as malignant or benign using a convolutional neural network (CNN).

III. METHODOLOGY

System Architecture

Convolutional, RELU, pooling, and fully connected normalized layers are among the many hidden layers that make up a Deep-CNN, a subtype of DNN. Weights shared by CNN at the convolutional layer help the network function better while using less memory. The 3D volumes of the neurons, local connection, and shared weights are the key characteristics of CNN. Through the use of a learned kernel and various input image subregions, a convolution layer creates a feature map. When the error is small, a non-linear activation function is then applied through the ReLu layer to enhance the convergence properties. In a pooling layer, a portion of the picture or feature map is selected, and the representative pixel is the one with the highest value among them or the average value. As a result, the sample size is significantly reduced. In the output stage, convolutional layers and conventional Fully-Connected (FC) layers are occasionally combined. The two sorts of operations that the pooling layer often performs are max pooling and means pooling. The average neighborhood is determined within the feature points in mean pooling, and it is calculated within the feature points up to a maximum in max pooling. The neighborhood size limitation error is lessened and background information is retained through mean pooling. Max pooling increases the amount of texture information retained by reducing the convolution layer parameter estimation error brought on by the mean deviation.

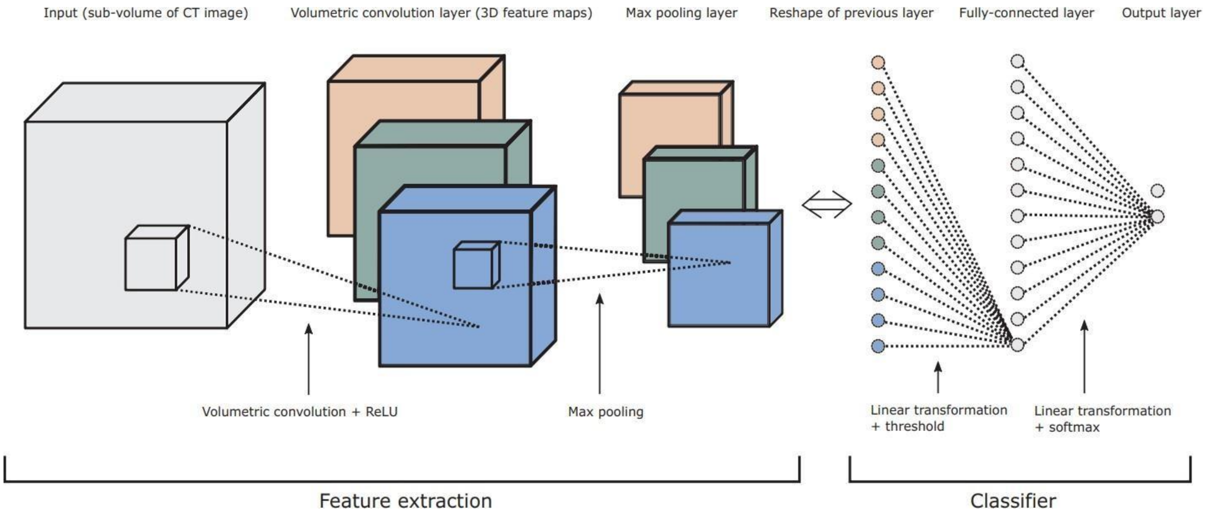

Fig. 1 Deep-Convolutional Neural Network Architecture

The proposed method follows these stages:

Data Set:
The training dataset is provided by the Image Database Resource Initiative (IDRI) and the Lung Image Database Consortium (LIDC) (IDRI). An LIDC and IDRI are made up of 1000 CT scans of both large and small tumors that were saved in the Digital Imaging and Communications in Medicine (DICOM) format.

Image Segmentation:
When a photograph is segmented, the visual image is divided into a number of sections. Usually, this makes it easier to recognize boundaries and artifacts. The goal of segmentation is to make it easier to translate an abstract image into a concrete image that can be rapidly and clearly examined.

DOI: 10.17148/IARJSET.2023.10218

Pre-Processing:

The median filter is used in the preprocessing stage to restore the tested image by reducing the impacts of acquisition degradations. There is a discussion of several preprocessing and segmentation methods for lung nodules. Each pixel's value is simply replaced by the median of its neighbors, including itself, by the median filter. As a result, pixels with values that are significantly different from those of their neighbors will be removed.

Convolutional Neural Networks:

A CNN, a subtype of DNN, is made up of multiple hidden layers, including convolutional, RELU, pooling, and fully connected normalized layers The three main characteristics of CNN have shared weights, local connections, and 3D volumes of the neurons. By convolutionally integrating several input picture subregions with a learned kernel, a convolution layer produces a feature map. Then, when the error is small, a nonlinear activation function is applied through the ReLu layer to enhance the convergence qualities.

A CNN is made up of various layers, including By using a filter that scans a small portion of the entire image at a time, the convolutional layer produces a feature map to predict the class probabilities for each feature. Using a pooling layer (down-sampling), the convolutional layer generates less information for each feature while preserving the most crucial information (the process of the convolutional and pooling layers usually repeats several times). It flattens the outputs of earlier layers into a single vector that may be utilized as an input for the following layer through the usage of a fully linked input layer. To accurately forecast a label, weights are applied to the input created by the feature analysis.

IV. CONCLUSION

Here, the survey studies on the classification of lung nodules are discussed. Based on the data from the survey, the detection and classification procedure to be used for lung nodule classification is addressed. In order to save a person's life at an early stage, this study provides a more detailed description of the different forms of lung nodules that can be found in our bodies..

REFERENCES

[1] Efficient Identification of Lung Cancer on Computed Tomography Images by using Methodology Classification based on Deep Learning Dr. K Gurnadha Gupta, Dr. T Kumaresan, Dr. Sasikala Dhamodaran 2021

[2] Lung Cancer Detection Using Deep Learning Network: A Comparative Analysis Susmita Das, Swanirbhar Majumder 2020

[3] Lung Cancer Detection Using Convolutional Neural Network Dunke Siddhi1, Tarade Swapna2, Waghule Pratiksha 2022

[4] A Novel Approach for detecting lung cancer using image processing N.V.Chaudhari1, Dr. A.V.Malviya 2021

[5] Lung Cancer Detection Techniques Namita Awasthi1, Vimal Kumar Awasthi2, Sudhriti Sen Gupta3 2021

[6] Lung Cancer Detection using Convolutional Neural Network Spoorthi Hiremath1, Dr. Dhananjaya. V2 2022