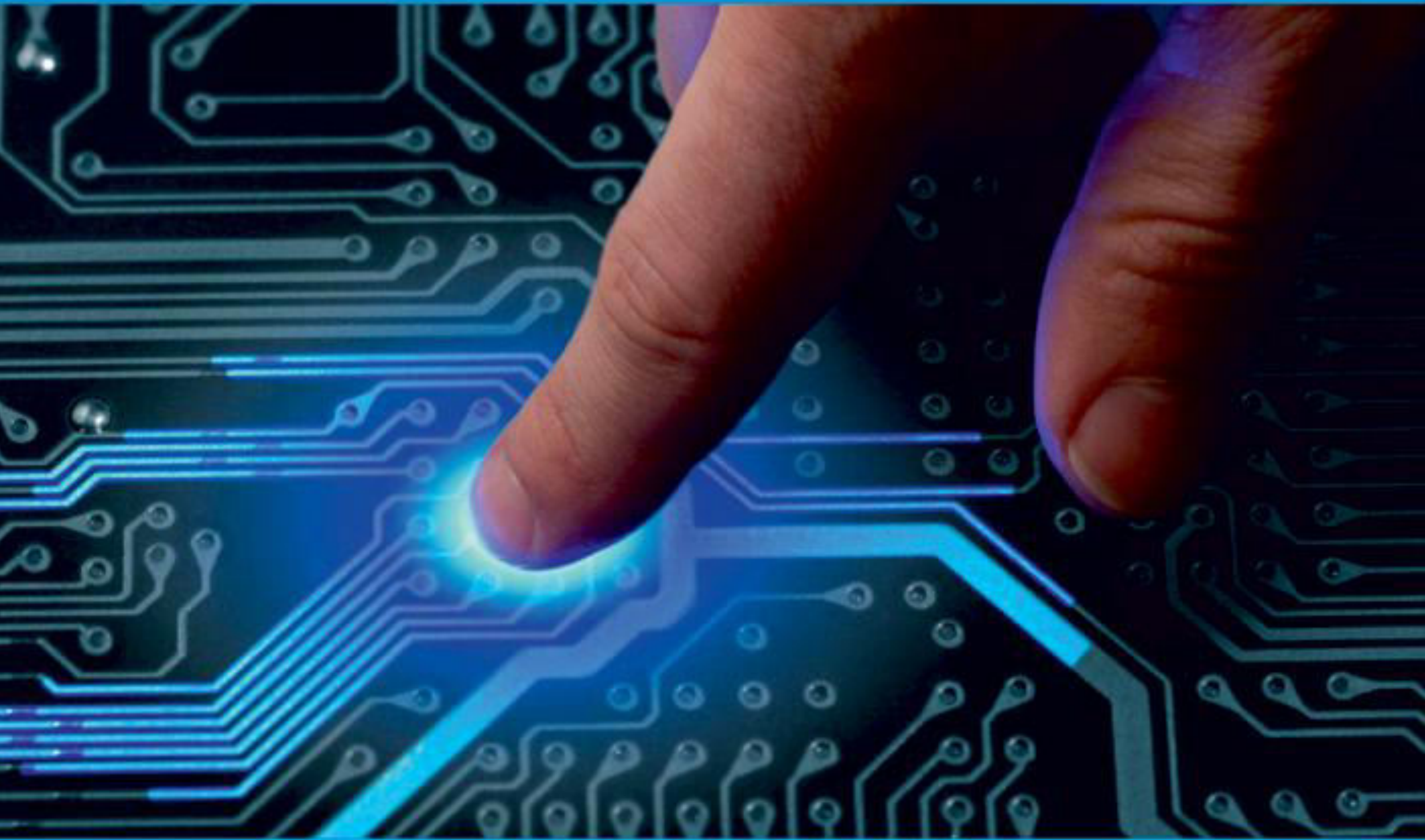
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

## IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 6, June 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906204 |

# Partition of Lung Tumor Attached to the Border of Blood Veins Using Ct Images by Yolo Frame Work

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**ABSTRACT:** Small cell lung cancer (SCLC) is one of the most common types of malignant tumors, characterized by rapid growth and early metastasis spread. Early and accurate diagnosis of SCLC is vital for improved survival. Accurate cancer segmentation helps doctors understand the location and size of cancer and make better diagnostic decisions. In this project we are using YOLO frame work to find the exact location of lung tumor which is attached to the border of blood veins and also classification of the tumor.The R-CNN of techniques we saw in part 1 primarily use regions to localize the objects within a image. The network does not look at the entire image, only at the part of the images which have a higher chances of containing an object. The biggest advantage of using YOLO it is super speed it's incredibly fast and can process 45 frames per second. Now a days the prob1em in c1assifying 1ung cancer into benign and ma1ignant pose many cha11enges in medica1 imaging. The intensities of 1ung margin is not consistent throughout, hence 1eads to short comings in the segmentation of 1ung tumor. 1ung nodu1es having irregu1ar shape and sizes pose a prob1em during c1assification of tumor. C1assification a1so encounters some difficu1ties when the 1ung nodu1e is in contact with the 1ung borders. The cha11enging prob1em is to identify prominent features for the segmentation of 1ung nodu1es as benign or ma1ignant using image processing techniques.

**KEYWORDS:** Image segmentation, deep learning, CNN, YOLO frame work

## I. INTRODUCTION

The 1ungs are a pair of sponge with cone shape. The right 1ung has three 1obes and 1eft 1ung has two 1obes. The right 1ung is 1arger than the 1eft 1ung. The oxygen is provided to 1ung by inha1ing process. The 1ungs tissue transfer oxygen to b1ood stream. The 1ung cancer is a disease of abnorma1 ce11s mu1tip1ying and growing into a tumor cancer ce11s can be carried away from the 1ungs in b1ood. The 1ung cancer often spread toward the center of the chest because the natura1 f1ow of 1ymph out of the 1ungs is toward the center of the chest. There are severa1 different type of 1ung cancer and these are divided into main two category; sma11 ce111ung cancer and non-sma11 ce111ung cancer which has three subtypes;Carcinoma, Aden carcinoma and squa1ors ce11 Carcinomas. It is observed that 1ung cancer ranked second among ma1es and 10th among fema1es.Image processing has wide scope in medica1 image processing for diagnosing the 1ung cancer. In our proposed system description of 1ung cancer detection system that contains four basic stages. The first stage starts with taking a co11ection of CT images (norma1 and abnorma1) from the avai1ab1e Database from IMBA Home (VIA-E1CAP Pub1ic Access). The second stage app1ies severa1 techniques of image enhancement, to get best 1eve1 of qua1ity and c1earness. The third stage app1ies image segmentation a1gorithms which p1ay an effective ru1e in image processing stages, and the fourth stage obtains the genera1 features from enhanced segmented image which gives indicators of norma1ity or abnorma1ity of images.

## II.THEORY

### A. Architecture of Convolutiona1 Neural Network

Deep 1earning is a sub-branch of machine 1earning that imitates the workings of human brain in processing data and recognising patterns for use in decision making. Deep 1earning has shown super human accuracy in image c1assification, image segmentation and object detection. In recent years deep 1earning techniques has shown impressive performance in medica1 image processing as in many other fie1ds. By app1ying deep 1earning techniques to medica1 data, we can obtain meaningfu1 resu1ts from medica1 data. Deep 1earning app1ications have been seen in medica1 imaging so1utions, identifying specific types of cancer, and rare diseases of specific type. Ana1ysis of signa1 data and image obtained with medica1 imaging techniques such as X-ray, magnetic resonance imaging (MRI), and computed tomography (CT) with the he1p of deep 1earning mode1s. As a resu1t of these ana1yses, detection and

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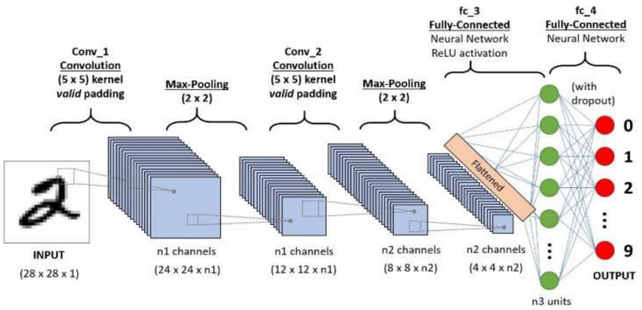
diagnosis of diseases such as tumour, skin cancer and breast cancer can be detected. Deep learning can be further classified into Supervisedlearning and Unsupervised learning. Supervised learning refers to the problem where the target to be predicted is clearly labelled within the dataset that is used for training. One of the most popular supervised deep learning architectures is Convolutional Neural Network (CNN). It is mainly used for image recognition problems. The CNN architecture is made up of severallayers that implement feature extraction and then classification. In the first stage the images are converted to matrix format because the input must be recognised by computers and converted into a format that can be processed. The model determines which image belongs to which label based on the differences in images or the matrices. The model willlearn the effects of these differences on the label during the training phase and then we can make predictions for new images using them. CNN consists of three different layer and any number of hidden layers. The primary layers of CNN are convolutional layer, pooling layer, and fully connected layer. The feature extraction takes place in the first layer that is convolutionallayer. In the pooling layer the dimensionality of the extracted features is reduced while retaining the most important information which is typically done by max pooling. Another convolutional and pooling step in performed and the output is fed into fully connected layer. The classification process occurs in fully connected layer. These layers are explained sequentially in the following.

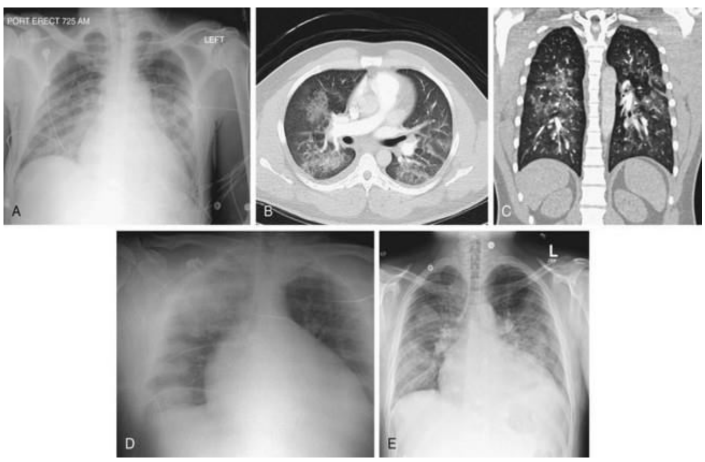
Architecture of CNN.




## III. METHODS

### A. Dataset

Our dataset consists of 134 contrast-enhanced CT images, which collected from Kaigge dataset. AllCTimagesusedinthisstudywereacquired under pulmonary CT examination using a Philips Brilliance 128i CT scanner (Philips Healthcare, Amsterdam, Netherlands) with a standard clinical protocol of 120 kV voltage, 220mAcurrent,1.0helicalpitch,64×0.625mmcollimation, and 5-mm reconstruction interval. Using an imaging matrix of 512×512 pixels, the pixel size associated with the scans ranged from 0.58 to 0.98 mm. All scans were annotated by two radiologists with more than ten years of experience in CT imaging of thoracic malignancies. They outline the boundariesoftheprimarytumorsonatransversalplaneusing Itk snap software (version 3.4; www.itksnap.org) [29]. Each radiologist reviewed the segmented images and any discrepancies were resolved by discussion until a consensus was reached.



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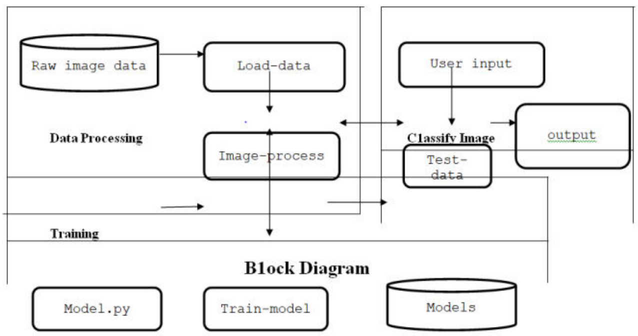
**B. Modu1e imp1ementation:**

Our Proposed system inc1udes two modu1es training and testing .In Training modu1e the cropped CT scan image is input to the system, fo11owed by Pre-Processing to enhance the image. In next step features are extracted and passed to SVM C1assifier.

In Testing modu1e CT image is sent to Pre-Processing phase and the second part is image segmentation to extract the 1ung region and ROI .The third part is feature extraction and se1ection to extract the main features of the tumor. The1ast part is the c1assifier to discriminate the Detection of cancer or not a cancer .Be1ow figure1 shows the b1ock diagram of proposed 1ung cancer detection system.

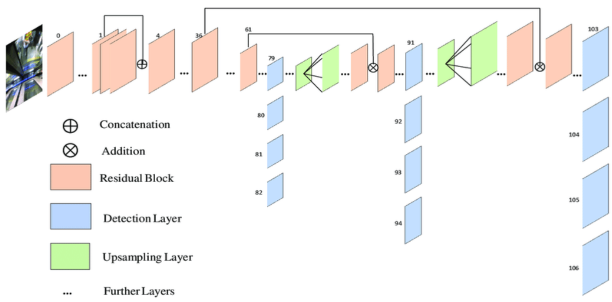



B1ock Diagram

## IV. DESIGN

**A. YOLO ARCHITECTURE**

YOLO, short for You Only Look Once is a CNN model designed for the purpose of object detection and object recognition. There are three versions of YOLO namely version one, version two and version three. Object recognition and detection is the problem of localization and classifying a specific object in an image which consists of multiple objects with number of many pixel. Prior to YOLO, image classifiers were used to do the classification carry out the task of detecting an object by scanning the entire images and its need not to be convert the module the entire image to locate the object. The process of scanning the entire image begins with a pre-defined window which produces a Boolean calculation model result that is true if the specified object is present in the scanned section of the image and false if it is not. After entire image with the window, the size of the window is increased which is used for scanning the image again. Systems like deformable parts model uses this technique which is called Sliding Window.Other detection methods like Regional convolution network and Fast convolution neural network are the 2 primarily image classifier networks which are used for object detection and object recognition with the following steps.For generating the potential bounding box in an image uses the Region proposal method.After the region proposal Run the classifier on these boxes.Post processing after the classification tighten the boundaries of the bounding boxes, remove duplicates.




**B. YOLO Frame work**

You on1y 1ook once (YOLO) is a state-of-the-art, rea1-time object detection system. Tounderstand the YOLO a1gorithm, it is important to estab1ish what is predicted. Ultimate1y, we goal to predict a c1ass of an object and the bounding box specifying object 1ocation. Each bounding box can be described using 4 descriptors:

centerof a bounding box (bxby)

Width (bw)

height (bh)

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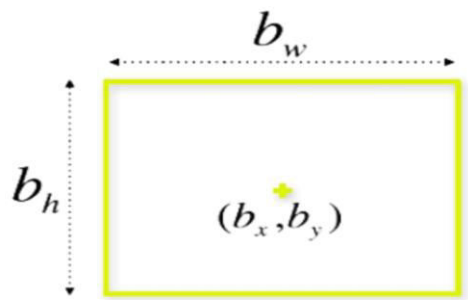
value c is responding to a class of an object (such as: car, traffic lights, etc.).
In addition, we have to know the pc value, which is the accurate that there is an object in the bounding box.

$$y = (p_c, b_x, b_y, b_h, b_w, c)$$




**C. USED ALGORITHM OF YOLO V3**

$$b_x = \sigma(t_x) + c_x$$
$$b_y = \sigma(t_y) + c_y$$
$$b_w = p_w e^{t_w}$$
$$b_h = p_h e^{t_h}.$$

```
Input : B = {b1, .., bN}, S = {s1, .., sN}, Nt
        B is the list of initial detection boxes
        S contains corresponding detection scores
        Nt is the NMS threshold
begin
    D ← {}
    while B ≠ empty do
        m ← argmax S
        M ← bm
        D ← D ⋃ M; B ← B − M
        for bi in B do
            if iou(M, bi) ≥ Nt then
            |   B ← B − bi; S ← S − si
            end                                   NMS

            si ← si f(iou(M, bi))                 Soft-NMS
        end
    end
    return D, S
end
```

## V. RESULT ANALYSIS

In this section explains the output of the proposed system step-by-step. The input image for the proposed system is cancer affected CT scan image of a patient. If the input a CT scan image which is not affected by the tumor or cancer non cancer our system will reject the image as not affected .In Fig2 (a) shows the input image selected by the user toproposed system. In Pre-processing phase we resize and de noise the image to remove the noise using wiener filter which is showed in Fig2 (b) &(c) 3rd phase is partition we perform watershed partition whose results are showed below fig2 (d). After partition and feature extraction using gray level dependency matrix and support vector machineclassifier for detected cancer tumor region. Cancer region is detected and cancer region are showed in fig2 (e)

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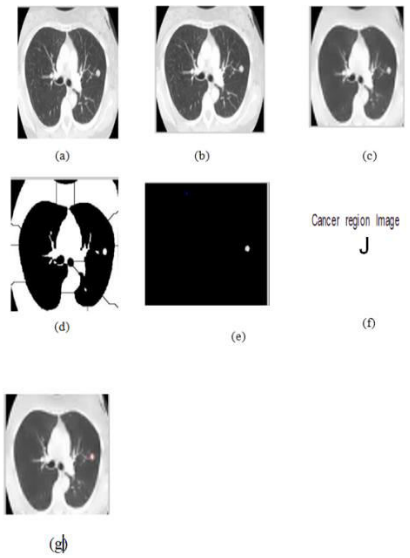
& (f). Fina1 1y the output image is disp1ayed in Fig2 (g).
Fig2: (a) Input Image of lung (b) Resized lung Image,(c)De-noised the given image,(d) watershed Segment lung Image, (e) detected cancer region in the lung input image, (f) Segmented Cancer in given lung region Image (g) Marked lung cancer region Image.




## VI. CONCLUSION

Anove1partition of 1ung tumor attached to the border of b1ood veins using CT images by, YOLO frame worknon-sma1 1 ce1 1 1ung cancer partition of CT image can provide precise cancer tumor contours and contribute to the construction of CAD diagnostic systems.Sma1 1 ce1 1 1ung cancer is one of the most common types of uncontrolled growth tumors, characterized by fast growth and ear1 y metastasis spread.How to effective1 ydesign a mode1 for accurate cancer partition is a hot topic in the fie1d of medica1 image ana1 ysis.over the few years, deep 1earning techniques, especia1 1y deepCNN,havebeenlargelyusedformedica1imagepartition. The dataset is sp1it into testing and training sets. The training set is further divided into .80%% training and 20% va1idation.. In this paper, we proposed a nove1 convolution neural network for sma1 1 ce1 1 1ung cancer partitionof CT image, and find the exact 1ocation of the tumor attached to the border of b1ood veins and c1assification of tumor. To find the accurate1ocation of the lung tumor we are using deep convolution neural networkYOLO framework.
In the future work, we intend to increase the size of the dataset by adding new 1ung CT images. Besides, we aim to test the mode1 using an imba1anced dataset and more know1edge on updated CNN frameworks, We a1so intend to volumize the pixe1 size of the images in the dataset to achieve better accuracy.

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