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Research Article

LUNG CANCER DETECTION USING DEEP LEARNING

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ABSTRACT

In this paper we focuses on detecting the lung cancer at the very early stage using advanced deep learning architecture and transfer learning methods. Lung cancer is one of the leading causes of death in both men and women around the world, with an estimated five million deaths each year. In the detection of lung disorders, a computed tomography (CT) scan may be very helpful. The key goal of this project is to identify cancerous lung nodules in an input lung picture and to distinguish lung cancer and its magnitude. This study employs innovative Deep learning approaches to detect the presence of cancerous lung nodules. The best feature extraction techniques are used in this study, including the Histogram of Oriented Gradients (HoG), wavelet transform-based features, Local Binary Pattern (LBP), Scale Invariant Feature Transform (SIFT), and Zernike Moment. The VGG16 algorithm is used to find the best function after extracting texture, geometric, volumetric, and strength features. Finally, Deep learning is used to classify these functions. The computational complexity of CNN is reduced thanks to a new VGG16.

Keywords: Lung cancer. Deep learning. Classifiers. Real-time. CNN, VGG16

INTRODUCTION

Lung cancer is one of the most lethal illnesses on the planet. According to the World Health Organization (WHO), lung cancer causes about 7.6 million deaths worldwide each year. Furthermore, the number of people affected by cancer is expected to begin to rise, reaching about 17 million by 2030. Lung cancer can only be cured if it is discovered at an early stage. The two most common anatomic imaging modalities used in the diagnosis of various lung disorders are X-ray chest radiography and Computer Tomography (CT). Physicians and radiologists use CT photographs to classify and recognise diseases, specifically visualise the morphologic extents of diseases, explain disease trends and magnitude, and monitor the clinical course of diseases and response to therapy. The volumetric CT technique has introduced spiral scans which shorten the scan time and, when used in thoracic imaging, reduce the artefacts caused by partial volume effects, cardiac motion, and unequal respiratory cycles. As the progress of CT technology, the high-resolution CT test has happened to the imaging modality of choice for the recognition and identification of lung diseases. Despite the fact that High-Resolution Computed Tomography (HRCT) proposes images of the lung with increasing anatomic resolution, visual perception or examination of a vast number of CT image slices remains a challenging process.

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For lung cancer screening, Nowadays Low-Dose helical Computed Tomography (LDCT) is being applied as a modality. The aim of this work is to extract features for classification and Severity finding. First, the input image is improved for image contrast using histogram equalisation, and then denoised using an Adaptive Bilateral Filter (ABF). After pre-processing, the next step is to find the lung region extraction. The Artificial Bee Colony (ABC) segmentation technique is used to isolate the lung area. In the ABC segmented image, the holes in the lung region are filled using the mathematical morphology technique. After that the texture features are extracted to find the cancerous lung nodules. After finding the location of the cancerous lung nodules the next process is to classify the lung disease name and its severity based on the feature extraction. A new CNN method based on VGG16 for reducing the computational complexity of CNN is proposed.

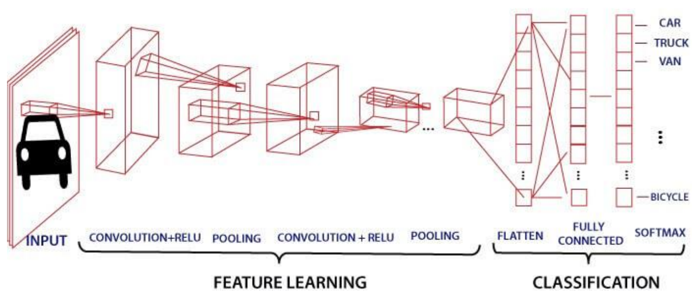
EXISTING SYSTEM

Established lung cancer diagnosis programmes that rely on CAD systems for symptom-based studies have low sensitivity, precision, and accuracy. Fuzzy rule-based methods, neural systems, and supervised learning systems were used to create the current systems. However, in the future, hybrid techniques that combine more than two systems can increase sensitivity, precision, and accuracy.

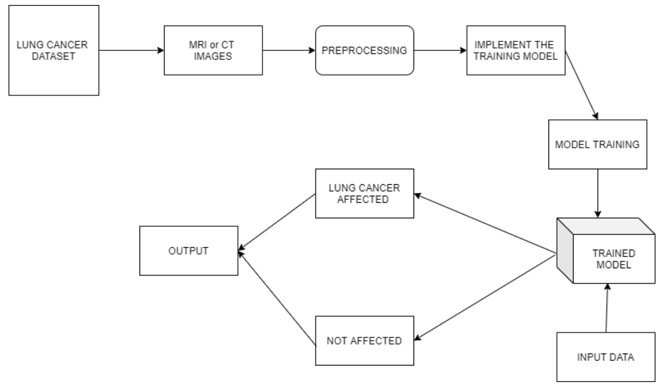
PROPOSED SYSTEM

In the proposed system we have used 2d segmented CT images ,because 2d datasets are ease to preprocess. Here, the image could be enhanced or modified to improve image quality. Histogram of Oriented Gradient could be performed to increase the contrast of the images. The datasets are not much more in size so very easy to handle it. Advanced transfer learning model vgg16 and resnet 50 are used so that it can reduce the computational complexity of CNN.

CNN: Convolutional Neural Networks is one of the most common types of neural networks used for image detection and recognition. Convolutional neural networks are commonly used in fields such as scene identification, target tracking, and facial recognition, among others. CNN takes an image as input and classifies and processes it into one of the categories, such as dog, cat, lion, tiger, and so on. The machine interprets an image as an array of pixels, which is dependent on the image's resolution. It will appear as h * w * d, where h = height, w = width, and d = depth, depending on image resolution. An RGB image, for example, is a 6 * 6 * 3 matrix array, while a grayscale image is a 4 * 4 * 1 matrix array.



BLOCKDIAGRAM



METHODOLGY

Data Set Collection: The first step is to collect data in the form of photographs. The machine must learn while doing in order to create a classification model. To recognise an object, the machine have to see a large number of image. Deep learning models may also be trained for other forms of data, such as time series data and speech data. The relevant data available to diagnose lung cancer in the sense of the work surveyed in this paper would be photographs. Chest X-rays, CT scans, sputum smear microscopy, and histopathology images are all examples of images that may be used.

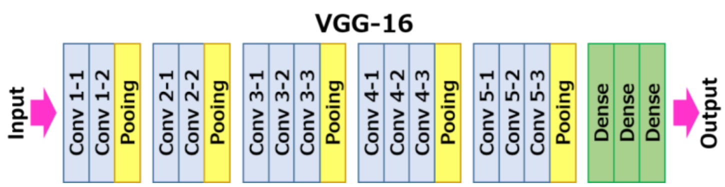
Pre-processing: Pre-processing is the next step. To boost picture consistency, the image should be improved or changed .and also t o improve the contrast of the images, Contrast Limited Adaptive Histogram Equalisation (CLAHE) may be used. Image manipulation techniques such as lung segmentation and bone removal may be used to classify the area of interest (ROI), in which lung cancer diagnosis could be conducted on the ROI. Edge detection may also be used to represent
data in a different way.

Augmentation: To maximise the amount of data available, data augmentation may be added to the images. Feature extraction may also be used to help the deep learning algorithm recognise essential features that will help to identify a specific entity or class. This phase produces a series of images in which the image quality has been improved or unnecessary artefacts have been deleted.

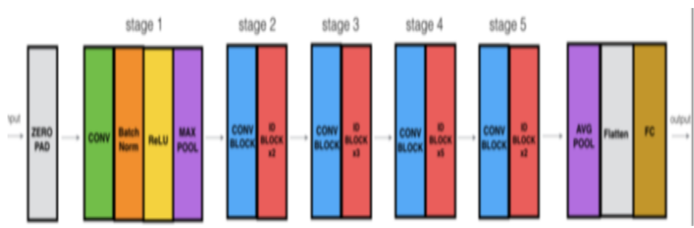
Training&Transfer Learning: Three factors should be included in the fourth and final phase, namely training and transfer learning. The selection of a deep learning algorithm, the use of transfer learning, and the use of an ensemble are all factors is to be considered. Deep learning algorithms include deep belief networks (DBN), multilayer perceptron neural networks (MPNN), recurrent neural networks (RNN), and convolutional neural networks (CNN). Algorithms have a variety of learning types. Certain algorithms perform best for different types of data. CNN is ‘ effective while using images. The essence of the data should guide the selection of a deep learning algorithm.When it comes to classification, the term "ensemble" refers to the use of several models. Techniques like transfer learning and ensemble learning are used to cut training time, increase recognition performance, and minimise overfitting.

A model trained in one domain can be re-used in another through transfer learning. Transfer learning can be done with or without a model that has already been learned. A pre-trained model is one that was created to solve a similar problem. Instead of starting from scratch to solve a related problem, a model trained on a different problem is used as a starting point. Despite the fact that a pre-trained model was trained on a task that is distinct from the current task, the features acquired were considered to be useful for the new task in the majority of situations. The aim of deep learning model training is to find the right weights for the network through a series of forward and backward iterations. The weights and architecture obtained can be used and adapted to the current problem by using pre-trained models that have been previously trained on massive datasets. The lower cost of preparation with the new model is one of the benefits of a pre-trained model. This is because the algorithm just has to learn the weights of the last few layers because pre-trained weights were used.

Vgg16: In their paper "Very Deep Convolutional Networks for Large-Scale Image Recognition," K. Simonyan and A. Zisserman from the University of Oxford proposed the VGG16 convolutional neural network model. In ImageNet, a dataset of over 14 million images belonging to 1000 groups, the model achieves 92.7 percent top-5 test accuracy. It was one of the most well-known models submitted to the 2014 ILSVRC. It outperforms AlexNet by sequentially replacing big kernel-size filters (11 and 5 in the first and second convolutional layers, respectively) with multiple 33 kernel-size filters. VGG16 had been training for weeks on NVIDIA Titan Black GPUs.

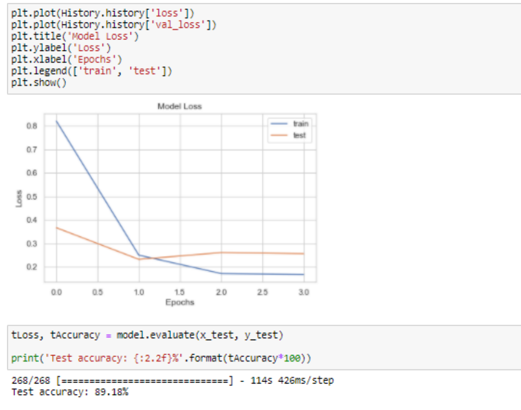


Resnet 50: ResNet-50 is a 50-layer deep convolutional neural network. You will load a pretrained version of the network from the ImageNet database , which has been educated on over a million images. The network will sort images into 1000 different object types, including keyboards, mice, pencils, and a variety of animals. As a result, the network has learned a variety of rich feature representations for a variety of images. The network's image input resolution is 224 by 224 pixels.



CONCLUSION

The Vgg16 Model was trained using Jupyter Notebook on windows or any other System. Training time was very time consuming . The accuary provided by transfer learning vgg16 is around 90%.The Resnet Model was trained using Jupyter Notebook on Windows/ any other system. Training time was very time consuming . The accuary provided by transfer learning vgg16 is around 59 which is lesser than the vgg16 model



Vgg16 Result

Resnet50 Result

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