Detection and Segmentation of Corona Virus Infected Region of Lung in CT images by using Deep learning approach

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Abstract: This research presents an application of lung segmentation of an internal organ from computed tomography images using an artificial intelligence development approach. The deep convolutional neural network was used to perform semantic segmentation of an internal organ by training through different computed tomography image slices with a medical dataset that has abnormal physiology. Coronavirus disease infected on the lung datasets were used as a study in this research with adjusted deep fully convolutional neural network compared with an architecture of U-Net model that was used to implement the experimental process. However, this research will aim to develop a deep learning model as an image processing to use with medical image data to reduce the time in a part of treatment planning.

IndexTerms - **Deep learning, Image Segmentation, Computational modeling, Computed tomography, Lung, Convolutional neural networks**

I. INTRODUCTION

COVID-19 presentation, which began with the reporting of unknown causes of pneumonia has rapidly become a pandemic. The most common test technique currently used for COVID-19 diagnosis is a Real-Time Reverse Transcription-Polymerase Chain Reaction (RT-PCR). We are aiming to design a Non-Contact method and breaking human intervention like swab collection or testing in a short period of time. Chest Radiological Imaging such as Computed Tomography (CT-Scans) have vital roles in early diagnosis and treatment of this disease. Doctors diagnose based on clinical and chest CT results, CT Scan is widely used for COVID-19 detection.

II. LITERATURE REVIEW

[1] Siti Raihanah Abdani ; Mohd Asyraf Zulkifley ; Nuraisyah Hani Zulkifley in the study " A Lightweight Deep Learning Model for COVID-19 Detection" which was based on 14 layers of CNN with a modified Spatial Pyramid Pooling model. This network allows to identify the covid 19 disease for various severity levels. SPP- Covid -Net achieves the best mean accuracy. The implementation was easy in this paper.

[2] João O. B. Diniz, Darlan B. P. Quintanilha "Segmentation and quantification of COVID-19 infections using pulmonary vessels extraction and deep learning". .In this study the aim was to automatically segment infections caused by covid 19 and provide quantitative measures of these infections to specialists thus serving as a special tool using pulmonary vessel extraction .

[3] Aboul Ella Hassanien, Hassan Aboul-Ella " Automatic CT COVID-19 Lung Image Classification System based on Multi-Level Thresholding and Support Vector Machine" In this method, The deep studying based methodology was recommended for the detection of covid-19 by multi level thresholding and Support Vector Machine.

[4] Wentao Zhao " Deep learning for COVID-19 detection based on CT images" In this study, they proposed a screening tool where they use chest CT scans to diagnose the patients for COVID-19 pneumonia. They built a 2D segmentation model using the U-Net architecture, which gives the output by marking out the region of infection.

[5] Rohit Lokwani, Ashrika Gaikwad [5], "Automated Detection of COVID-19 from CT images using Convolutional Neural Networks in this study they proposed a prospective screening tool wherein they use chest CT images to diagnose the patients for COVID-19 pneumonia. They build a 2D segmentation model using the U-Net architecture, which gives the output by marking out the region of infection.

[6] Lu Huang [6],"Serial Quantitative Chest CT Assessment of COVID-19: A Deep Learning Approach" in this study The approach could potentially eliminate the subjectivity in the initial assessment and follow-up of pulmonary findings in COVID-19.CT lung opacification percentages of the whole lung and five lobes were automatically quantified by a commercial deep learning software.

III. DATASET

In this paper CT SCAN images obtained from a diffrent open source which is used for the diagnosis of COVID-19. A key approach is to establish a comprehensive database with open access to CT images and associated clinical symptoms to facilitate the global fight against COVID-19
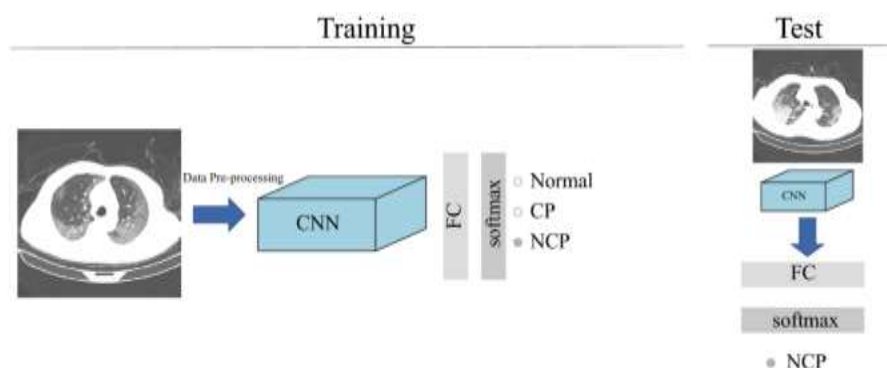

Fig1: Training of the dataset

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IV. METHODOLOGY

1. Dataset – The dataset is collected and then trained.

2. PRE-PROCESSING – THE UNWANTED NOISE IS REMOVED, RGB TO GRAY CONVERSION IS DONE.

3. Segmentation – The images are divided into multiple parts, and analyzing of each and every part of the image with respect to healthy lungs image.

4. Feature – Extracting only the main features required for classification and removing the unwanted layer.

5. Classifier – Here the CNN model is used to get more accurate result compared to the other natural techniques.
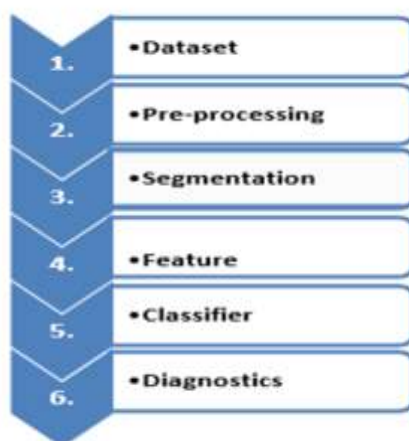

Fig2: Creation of dataset and model of the system

V. TECHNOLOGIES USED

1.Computed Tomography: A Computed Tomography (CT) scanning system uses an advanced technique and mathematical algorithm. The radiative tube and detector are properly mounted in a circular platform that will be rotated through the patient's body. For a one-dimensional CT image was obtained from various angles of radiation projection and will be processed with a digital computer to form images of a transverse slice.

2. OpenCV: OpenCV is an open source machine learning software library. OpenCV was built to provide a common method for computer vision applications and to accelerate the use of machine perception in the commercial products. OpenCV makes it easy to use and modify the code.

3. Deep Learning: Deep learning is part of machine learning methods based on artificial neural networks with representation learning. Learning can be based on supervised, semi-supervised or unsupervised methods.

4.Tensorflow: TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used as a training methods of deep neural networks.

5.Convolutional Neural Network(CNN): A Convolutional Neural Network is a Deep Learning algorithm which can take in an image as a input and assign importance to various objects in the image and be able to differentiate one from the other.

VI.   CONCLUSION

COVID death is an important issues which is faced by most of the countries in the world. This paper implements the design of a new concept Chest CT Scan which plays an important role in diagnosing COVID-19 which gives faster results in short period of time and it is a crucial goal because it would not only assist in disease diagnosis, also help in quantifying the severity of the illness, and hence, prioritize the population treatment accordingly.

REFERENCES

[1]. A Lightweight Deep Learning Model for COVID-19 Detection-Siti Raihanah Abdani;Mohd Asyraf Zulkifley;Nuraisyah Hani Zulkifley- IEEE Transactions on Big Data (Volume: 7, Issue: 1, March 1 2021).

[2]. Segmentation and quantification of COVID-19 infections in CT using pulmonary vessels extraction and deep learning- João O. B. Diniz, Darlan B. P. Quintanilha - Published: 24 June 2021.

[3]. Automatic CT COVID-19 Lung Image Classification System based on Multi- Level Thresholding and Support Vector Machine by Aboul Ella Hassanien, Hassan Aboul-Ella .

[4]. Deep learning for COVID19 detection based on CT images- Wentao Zhao- https://doi.org/10.1038/s41598-021-93832-2, published in 2021.

[5]. Automated Detection of COVID-19 from CT Scans using Convolutional Neural Networks -Rohit Lokwani, Ashrika Gaikwad -Copyrightc 2021 by SCITEPRESS – Science and Technology Publications, Lda. All rights reserved.

[6]. Serial Quantitative Chest CT Assessment of COVID-19: A Deep Learning Approach - Lu Huang - Published Online:Mar 30 2020https://doi.org/10.1148/ryct.202020007