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Automatic Detection Of Covid-19 Using X-RayAnd Ct Images (Neural Network)

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ABSTRACT:

Coronaviruses (CoV) are a large family of viruses transmitting between people that cause illness ranging from the common cold to more severe diseases such as Middle East respiratory syndrome (MERS-CoV) and severe acute respiratory syndrome(SARS-CoV). COVID-19 symptoms timeline fever, cough and muscle pain, nausea or vomiting, diarrhea. On average it takes 5-6 days from when someone is infected with the virus for symptoms to show, however it can take up to 14 days. The idea is our project to analyse the human lungs of X-ray image and CT image to visualizing the COVID-19 effect using Convolutional Neural Network using image processing technique we can easily visualize the effect of COVID-19 on X-ray and CT images. Deep learning and Neural Netowork are key factor used here. Neural Network helps to find normal and COVID affected patient of X-ray and CT images of lungs. In our proposed system, we used X-ray images and CT images fused together as a input to get the result.

KEYWORDS - CNN,COVID-19,Pneumonia,X-ray,CT,Imageprocessing

1. INTRODUCTION

COVID-19 is a recent impact on public health across the world. COVID-19 found to be highly infectious and contagious. The most Common test technique currently used for COVID-19 diagnosis is a Computed Tomography and Chest X-ray. COVID-19 spread rate is rapidly increasing and mortality rate has not been determined yet. Therefore, it should be prevent from further spreading to detect COVID-19 positive cases we are using Computed Tomography (CT) scans and Chest X-ray (CXRs) as the provide consistant COVID-19 manifestation. In this paper, our goal is to abserve the two different modalities (radiological image data) can be trained/ tested using deep neural network for this we using convolutional neural network CNN that can collectively trained/ tested both CT scan and CXRs.

1. LITERATURE SURVEY

Coronavirus outbreak and spreading across the world since December 2019, and has become common in a variety of countries. Detecting pneumonia in the critical stage of diagnosis. Radiologists find it beneficial to distinguish chest X-ray images among absence or presence pneumonia [1]. Physicians often use chest X-rays to quickly and cheaply diagnose disease associated with the area. However, it is much more difficult to make clinical diagnosis with chest X-ray than with other imaging modalities such as CT or MRI. With computer-aided diagnosis, physicians can make chest X-ray diagnoses more quickly and accurately [2].

The most widely used novel coronavirus (COVID-19) detection technique is a real-time polymerase chain reaction (RT-PCR). COVID-19 reveals radiological signatures that can be detected using chest X-rays. The evaluation of radiological signature is a time-consuming and error-prone task. An automatic analysis of chest X-rays is achieved using deep learning models [3]. COVID-19 has caused a devasting effect on both daily lives, public health, and the global economy. The DarkNet model was used in study as a classifier for the you only once (YOLO) real time object detection System.Artificial Intelligence techniques coupled with radiological imaging can be helpful for the accurate detection of this disease [4].

The SARS-Co V-2 virus-induced COVID-19 epidemic has spread rapidly across the world, leading to international outbreaks. The COVID-19 fight to curb the spread of the disease involves most states, companies, and scientific research institutions. AI based ML and DL methods for COVID-19 diagnosis and treatment [5].

Early classification of 2019 novel coronavirus disease (COVID-19) is essential for disease cure and control. CT images can be utilized for early classification of COVID-19 patients. A convolutional neural network (CNN) is used to classify the COVID-19 – infected patients as infected (+ve) or not (-ve). Extensive analysis shows that the proposed model can classify the chest CT images at a good accuracy rate [6].

2. EXISTING SYSTEM

Studies show that chest X-ray images, Computed tomography scans, Magnetic Resonance Imaging scans are considered in improving the analysis of presence of viruses in the lungs. Deep learning is used to analyze the different types of thoracic diseases, skin cancer, etc,. In this study, a convolutional neural network (CNN) model has been used to identify Covid-19 patients with the help of X-ray images. In previous study in March 2020, X-ray images are used to identify Covid-19 patients. However, since there was not enough data on Covid-19. In previous study dataset is limited and the success rate of the model in the multi – class classification is relatively low as compared to the binary class. The model made the incorrect predictions in poor quality X-rayimaginery and in patients with acute respiratory distress syndrome (ARDS).

3. PROPOSED SYSTEM

Convolutional neural networks (CNNs) are typically composed of three main facets

namely convolution layer, pooling layer, and dense layer. A CNN consists of multiple convolution and pooling layers that are followed by dense layers. The convolution and pooling layers can be arranged in several different ways; and their arrangements are conventionally based on the complexity of the problem. The typical final dense layer's (output layer) dimension is equal to the number of output classes. After every convolution the results are pooled, which ensures computational complexity reduction. This makes the tool computationally efficient, and is preferred in resource-constrained regions. Importantly, the number of generated parameters is less as compared to existing DNNs. For a quick and better understanding, we provide a few feature maps for CT scans and CXRs (both COVID-19 positive and negative). Thus, we give images of X-ray and CT as input and obtained a result. As a result, we created a mixed dataset (and balanced dataset) by taking bot CXRs and CT scans Finally, we get the classification of result whether the person is affected with covid or pneumonia or normal.

4. SYSTEM ARCHITECTURE

The entire architecture of the deep learning model is divided into four stages: Input stage, Preprocessing, Segmentation and Classification.

The first stage is the input stage in which input image is fed in to the model. As we give X-ray and CT images as input for preprocessing. The model will take the input and send it to the preprocessing stage. Thus, in this input some noisy background we used adaptive medium filter. After preprocessing the images without noisy background. The preprocessing will also change the color contrast of the necessary features by using a histogram equalization. In segmentation, the preprocessed image is sent for the segmentation where the details of the COVID-19 image are taken as necessary features for identification. Image Segmentation using Convolutional Neural Network, which labels the pixels. The Convolutional layers classify every pixel to determine the context of the image, including the location of object. The classification performance of different CNN models can be tested by increasing the number of COVID-19 Chest X-ray and CT images in the dataset. Three different binary classification is COVID, normal and pneumonia.

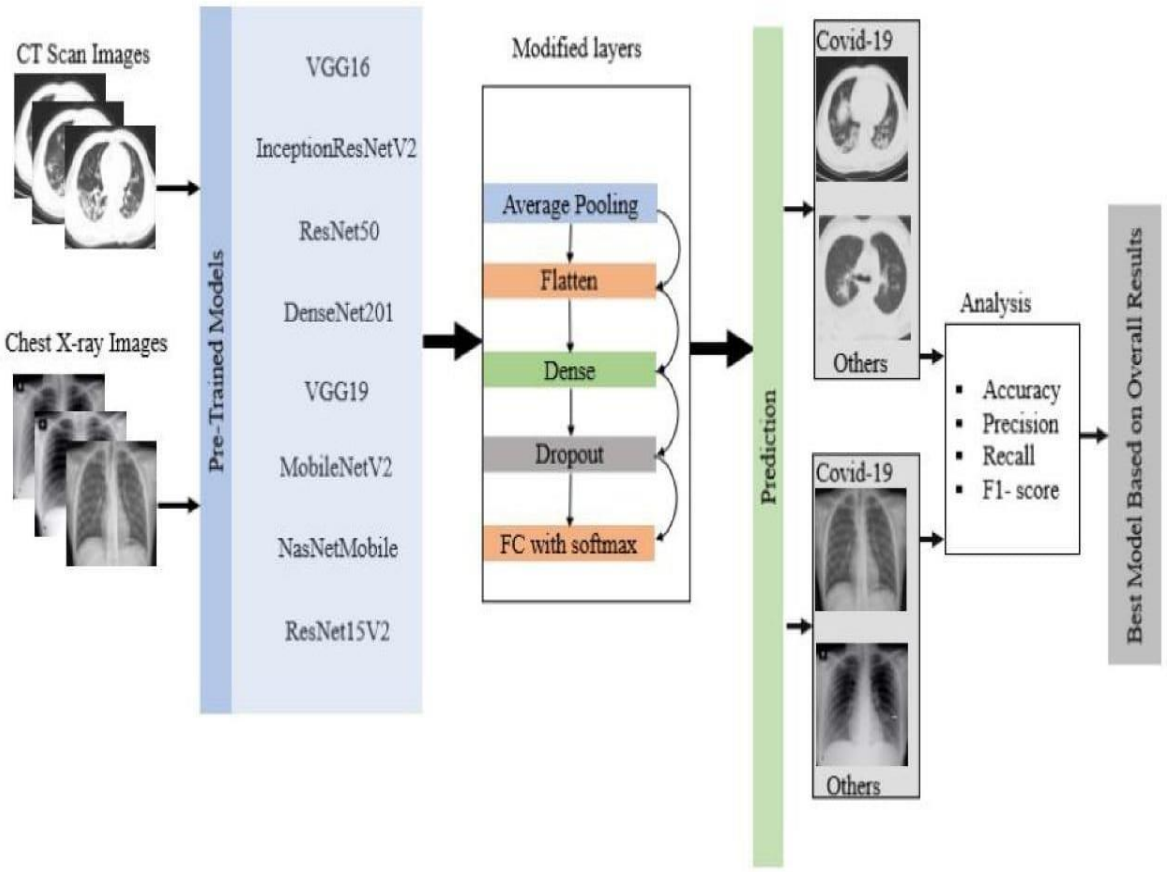

Fig 1 Architecture Diagram

5. RESULTS

MATLAB is a high-performance language for technical computing. MATLAB is used for the entire process and using which a friendly framework. The output frame work will help us to identify the disease and also will guide us through all the four stages of the process.

Fig 2 CT interface for the model

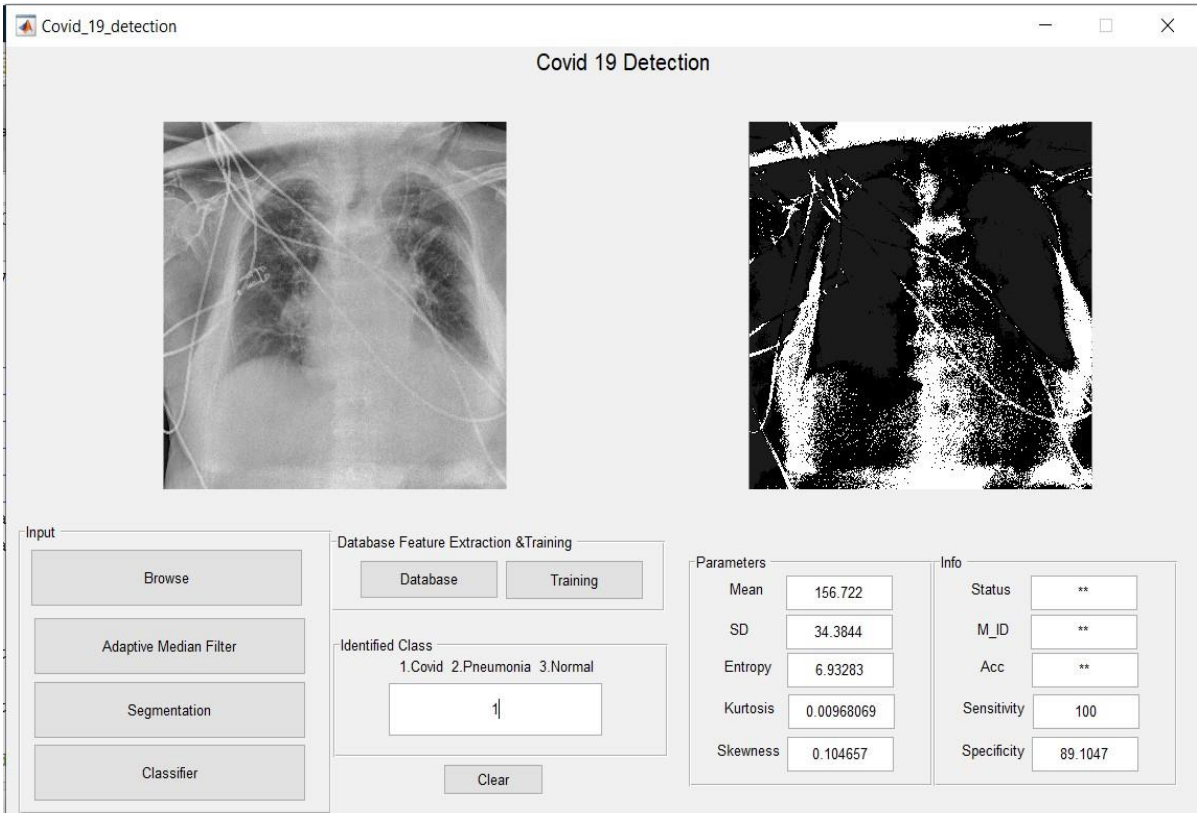

Fig 3 Chest X-ray interface of the model

Fig 2 and 3 shows the output interface of the model where the user can upload the image and process it stage by stage to know the correct stage of infection. Thus, the model is accessed and made user friendly.

6. CONCLUSION

In this paper, we have addressed the usefulness of a single CNN architecture for different data modalities (or datatypes) to detect COVID-19 positive cases, where we proposed a lightweight (9layered) CNN-tailored deep neural network. We have trained and tested both datatypes: Chest X-ray and CT scan images, and have achieved an overall accuracy of 99.06%. With these results, we have observed that multiple radiological imaging data to one architecture. Our experiment results are compared to demonstrate the effectiveness of models in classification and their poetential for Covid-19 classification, detection, prevention, and control. Further, we have achieved coherent results in detecting COVID-19 positive cases from major existing DNNs, such as InceptionV3, MobileNet, and ResNet. Our immediate plan is to work on computationally efficient CNN-tailored DNN by taking multimodal data, not just limited to two datatypes.

7. REFERENCES

[1] Jaiswal AK, Tiwari P, Kumar S, Gupta D, Khanna A, and Rodrigue s JJ, "Identifying Pneumonia in Chest X-ray: A deep learning approach",ScienceDirect, ELSEIVER, Volume 145, October 2019, Pages 511-518.

[2] Antin B, Kravitz J, and Martayan E, "Detecting Pneumonia in Chest X-rays With Supervised Learning", Stanford, Semantic Scholar, Corpus ID: 46632050, Published 2017.

[3] Narayan Das, Kumar N, Kaur M, Kumar V, and Singh D, "Automated Deep Transfer Learning Based Approach for Detection of Covid-19 infection in Chest X-ray", IRBM, 03 July 2020, doi: 10.1016/j.irbm.2020.07.001.

[4] Tulin Ozturk, Muhammad Talo, Eylul Azra Yildirim, Ulas Baran Baloglu, Ozal Yildirim, and U. Rajendra Archaya, "Automated Detection of COVID-19 cases using Deep neural netowrks with X- ray Images, Comput Biol Med 2020 Jun; 121: 10379, PMID: 32568675, Published online 2020 Apr 28.

[5] Tarik Alafif, Abdul Muneeim Tehame, Saleh Bajaba, Ahmed Barnawi, "Machine and Deep Learning Towards COVID-19 Diagnosis and Treatment: Survey, Challenges, and Future Directions", ResearchGate,October 2020.

[6] Dilbag Singh, Vijay Kumar, Vaishali, And Manjit Kaur, "Classification of COVID-19 patients from chest CT Images using multi-objective Differential evolution-based Convolutional neural networks, European Journal of Clinical Microbiology & Infectious Diseases (2020) 39:1379-1389, Published online: 27 April2020.

[7] Simonyan, K. and Zisserman, A. (2014). Very deep convolutional networks for large-scale imagerecognition. arXiv preprint arXiv:1409.1556

[8] Zech, J. R., Badgeley, M. A., Liu, M., Costa, A. B., Titano, J. J., & Oermann, E. K. (2018). Variable generalization performance of a deep learning model to detect pneumonia in chest radiographs: a cross-sectional study. PLoS medicine, 15(11), e1002683.

[9] Szegedy, C., Liu, W., Jia, Y., Sermanet, P., Reed, S., Anguelov, D., ... & Rabinovich, A. (2015). Going deeper with convolutions. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 1-9).

[10] Kermany, D. S., Goldbaum, M., Cai, W., Valentim, C. C., Liang, H., Baxter, S. L., ... & Dong, J. (2018). Identifying medical diagnoses and treatable diseases by image-based deep learning. Cell, 172(5), 1122- 1131.

[11] LeCun, Y., Bottou, L., Bengio, Y., & Haffner, P. (1998). Gradient-based learning applied to documentrecognition. Proceedings of the IEEE, 86(11), 2278-2324.

[12] Ali T et al (2020) Correlation of chest CT and RT-PCR testing in coronavirus disease 2019 (COVID-19) in China: a report of 1014 cases. Radiology. 10.1148/radiol.2020200642 [PMC free article] [PubMed]

[13] Sethy PK, Behera SK Detection of coronavirus disease (COVID-19) based on deep features. Preprints 2020, 2020030300. 10.20944/preprints202003.0300.v1

[14] Venugopal VK, Mahajan V, Rajan S, Agarwal VK, Rajan R, Syed S, Mahajan H (2020) A systematic meta-analysis of CT features of COVID-19: lessons from radiology. medRxiv. 10.1101/2020.04.04.20052241

[15] Kong W, Agarwal P (2020) Chest imaging appearance of COVID-19 infection. Radiol CardiothoracImaging. 10.1148/ryct.2020200028