



A REVIEW ON COVID-19 DETECTION USING VARIOUS METHOD AND ITS METHODOLOGY

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Abstract: Ongoing extreme intense respiratory condition (SARS-CoV-2) known as COVID-19, presents a dangerous scenario to the worldwide medical units, uncovering the limits of healthcare for arising irresistible infection pandemic. Fortunate discovery in treatment helps to identify the contaminated cases present in the initial phase in fighting COVID-19. In this survey, we proposed diagnostic method to identify the patient with Covid and normal effects using CNN algorithm using X-rays. Therefore, cell culture, by identifying fluorescent antibody, is one of the most reliable techniques for distinguishing SARS-CoV-2 contamination. Nonetheless, limitations forced by the administrative specialists restricted its general use and execution. Conclusion through radiologic imaging and opposite transcript PCR measure is habitually utilized, and considered as standard strategies, though isothermal enhancement techniques are right now very nearly clinical available and presentable. Remarkably, strategies like CRISPR-Cas and microfluidics have added a new aspect to the SARS-CoV-2 finding. Despite the fact that immunization programs have begun, and reports have shown a slight decrease in infection and its seriousness, SARS-CoV-2 being a positive-strand RNA infection makes the proceeding with repetition of the past circumstance. Before a proficient invention of anti covid dose, fast POC tests in view of atomic and immunoassay are still critical to manage the difficulties of COVID-19 and controlling its sickness. Further study is yet to be addressed to reveal the epidemiological, immunological, genomic, and proteomic highlights of the original infection that could support the execution of process for COVID-19 finding.

Keywords: SARS-CoV-2, COVID-19, severe acute syndrome, diagnostic, detection-tools, immunoassay, amplification, gene-sequencing, cell-culture, microscopy

1. INTRODUCTION

The expansion of an extreme pneumonia, which was first announced in December 2019 in Wuhan city of China, has transformed into a worldwide pandemic and a quickly arising emergency condition. The small strain of coronavirus which is similar like the intense SARS-CoV of 2002-2003, was the main origin for the ongoing pandemic (COVID-19). From that point, it was named as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), this virus did not have any exact cure all around the world rather than the convention proposed for suggestive treatment, despite the fact that FDA as of now has given crisis to allow the Remdesivir injectable for treatment. Coordinated approach around the world preparing for more improvement in antibody diagnosis method. Right now, FDA has endorsed Pfizer-BioNTech COVID-19 Vaccine and Moderna COVID-19 immunization for handling the crisis under proper utilization [1]

Following FDA endorsement, in which different nations have additionally support for the immunization in major proportion. Early conclusion is of prime significance for illness regulation and lessening transmission by speedy disengagement of patients and supporting basic treatment. Constant Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) has been the most generally method that carried out SARS-CoV-2 analytic device. A rising desire for point-of-care tests inclines the accessibility of a few other demonstrative devices and strategies. Mark of care tests are for the most part refreshed advancement that incorporates both the quick and lab free finding, which conceivably would meet the direness of the continuous circumstance. In addition, surveys on the appropriate examining site or exclusively on the standards of diagnostics have likewise been distributed. Notwithstanding, an extensive survey covering all the accessible being used and expected innovations for SARS-CoV-2 location alongside their assets and disadvantages as well as appropriate examining locales is expected to fill the hole. Our ongoing audit is planned to expound the missing piece relating to all the modern FDA-endorsed units and examine the arising advancements with the possibilities for supporting analytic and various diagnostic tools.[2][3]

2. LITERATURE REVIEW

Deep learning is a known research area in artificial intelligence. It provides promising results with end to end modeling without manual feature engineering in medical image classification multi-label image classification He et al., text categorization Imtiaz et al. [17]

ECG classification Huang et al. [16], glaucoma diagnosis Ajesh et al. [1] Since the start of COVID-19, researchers COVID-19 cases for all the countries, left y-axis shows total confirmed cases in million, and right y-axis shows total number of deaths in million Organization COVNet: a convolutional neural network approach for predicting COVID-19 from chest X-ray start focusing on vaccine development, detection of SARSCoV- 2 using medical images.

Salivary specimen detection Bajaj et al. [2], factors affecting mortality of physicians and nurses Jackson et al. And clinical feature analysis Zhao et al. Research Li et al. presents an approach which utilizes CNN on the chest CT for detecting COVID-19 patients.

To extracts a visual features from Chest CT images a deep learning model COVID-19 detection neural network (COVNet) is designed. The CT test for community-acquired pneumonia and non-pneumonia CT test are added in the dataset also to evaluate the proposed model. Results show that the model sensitivity and specificity are 114 of 127 (90%) and 294 of 307 (96%) for detecting COVID-19 patients.

Segmentation is an important and pivotal step for machine learning-based approaches that aim to detect COVID-19 patients through imaging techniques. It delimits the infected areas called regions of interest (ROIs) that can be used for further processing and analysis. So many researches works proposed deep learning-based approaches for CT segmentation for the quantification and prediction of COVID-19.

Similarly, authors in Gozes et al. utilize deep learning approaches to classify COVID-19 and non-COVID-19 patients from CT images. Segmentation of ROIs is done using UNet while the classification of patients is achieved through the Reset-50 2D deep convolutional neural network [10]

Results are 0.996 AUC, 98.2% sensitivity and 92.2% specificity. Another similar work that uses CT images to distinguish between COVID-19 and non-COVID-19 patients is Chen et al. [5].

The proposed approach shows accuracy comparable to that of radiologists' and can considerably reduce the reading time of the radiologists.

Authors in Jin et al. design a system that automatically analyzes the features from CT images to detect COVID-19 pneumonia features and help physicians in the classification of the patients [20]

A training dataset comprising of 1,136 CT images (723 positives for COVID-19) is used for this purpose. The 3D U-Net++ is leveraged for image segmentation while the classification is performed using ResNet He et al. The proposed approach achieves a sensitivity of 0.974 and a specificity of 0.922 for the used dataset. The above-cited research works employ deep learning models on the CT images for COVID-19 detection. CT images are high-quality 3D images achieved

from tomography. CT images are 3D images and contain hundreds of slices. It requires a substantial amount of time and computational resources to preprocess these images before we can put them to the training models.

On the other hand, X-ray images are more common and easy to process than those of CT images. Hence various researchers proposed machine learning models that can work with X-ray images.

The models are trained on chest X-ray images of 50 COVID-19 patients and 50 normal people. The achieved accuracy is 98.0%, 97.0% and 87% for ResNet50, InceptionV3 and Inception-ResNetV2, respectively. Anomaly detection is used to improve COVID-19 classification. Classification is performed to separate COVID-19 patients from pneumonia patients. Results show the sensitivity of 96.0%, the specificity of 70.07%, and AUC of 0.952.

Another deep learning model is worked out by authors in Wang and Wong for COVID-19 patient classification. The model i.e., COVID-Net is based on a deep CNN and uses X-ray images of 1203 healthy people, 931 bacterial pneumonia patients, 660 patients with viral pneumonia, and 45 patients confirmed for COVID-19. The testing accuracy of COVID-19 is 83.50% [48]

The studies that utilize X-ray images to classify COVID-19 patients and healthy subjects train on a small dataset of 45 to 70 images Shi et al. (2020). With the limited number of X-ray images, the robustness and accuracy of the proposed approach cannot be determined conclusively. Also, the results cannot be generalized with a smaller dataset. We, therefore, use Keras Image Data Generator class to augment images for increasing the number of X-ray images. Later we work out image pre-processing technique and a customized CNN model to increase the prediction accuracy for COVID-19 patients.

3. PROPOSED APPROACH

The proposed framework uses X-ray or CT scan images from the dataset which uses two modules basically first is model creation using CNN and then comparing the input images with that model for prediction of Covid or normal patient. Image preprocessing targets eliminating the noise in X-ray pictures to further develop the easy process for training required for CNN. The features present in input images have enormous useless content which unnecessary increase training time. The initial step is to decrease the size of the X-ray images. The size of X-ray images in the dataset is different for X-ray Images. In the initial step, we diminish this size to $120 \times 120 \times 3$. For edge discovery, a worth based channel ($[0, -1, 0], [-1, 6, -1], [0, -1, 0]$) is applied on the pictures. As the third step, Blue Green Red (BGR) picture is changed over completely to the luma part, blue projection, and red projection (YUV). [4]

It diminishes the goal of the U and V channels however keep Y at full goal. Since luminance is a higher priority than variety. Furthermore, diminishing U and V channels, the size of CNN can be decreased significantly. The design of the proposed CNN Deep learning-based approaches have shown prevalent execution than those of conventional AI approaches.[5] Owing to their huge exactness, profound learning-based models has drawn in impressive consideration during late days. They have been applied in an enormous assortment of areas like object detection, scene recognition, scene analysis, and so forth. Convolutional Neural Network (CNN) has been explicitly used for visualization purpose. CNN includes countless convolutional, as well as, pooling layers and completely associated with many layers, each layer performing different task for feature extraction filtering. For instance, the convolutional layer utilizes a proper size channel called jernel to extract feature from the information image. [6][7]

Another convolved picture is acquired each time a convolution is applied. Each convolved image contains features that have been extricated from the image of the past advance. Let $I(x, y)$ be a 2D info picture and let $f(x, y)$ be the 2D piece applied for convolution, then the convolution is Nielsen (2015) pooling and completely associated layers. The pooling layer is utilized to sum up the nearby patches of convolutional layers. It subsamples the convolutional layer to diminish the size of the element map.

The pooling layers computes the greatest and normal capacity over the convolutional layer and are called max pooling and normal pooling as for the capacity they perform. Dividing in the pixels of the images it utilized with pooling and is called stride or step. There is no initiation work in pooling layers; they utilize rectified linear unit (ReLU) [8]

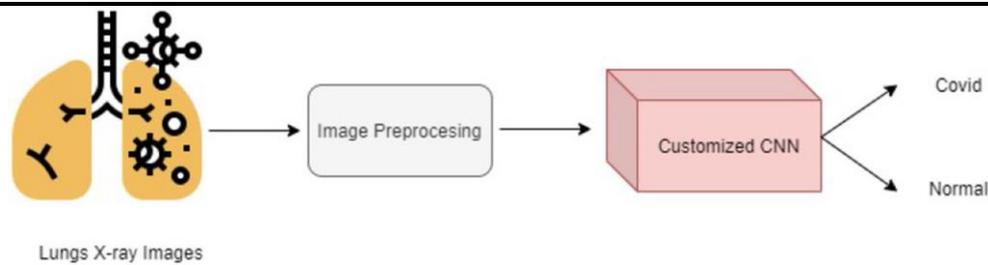


Fig 1. The flow of the proposed system

4. ADVANTAGES

- Convolutional Neural Network (CNN) has been fundamentally applied to extract the feature, and this remarkable characteristics has been tremendously applied in clinical picture examination that offers an extraordinary help in the healthcare community world for further research[10][11]
- CNN is a kind of AI network which has numerous layers, and is master to handle the high volume of information with higher precision and less computational expense.
- The fundamental construction of CNN contains convolution, pooling, flattening, and fully connected layers. [12]

5. DISADVANTAGES

- Maximum storage of database is the first and foremost need to achieve highest accuracy.
- Since training provides perfect prediction model which need time to train and process output.
- Due to layer by layer extraction it become expensive an technique

6. CONCLUSION

In this way an extreme intense respiratory condition (SARS-CoV-2) known as COVID-19, which presently generate a dangerous scenario to the worldwide medical units, found out a way to predict the Covid patient with higher accuracy. Many discoveries has been proposes in the paper to identify the contaminated cases present in the initial phase in fighting COVID-19. Proposed diagnostic method provides a better way to identify the patient with Covid and normal effects using CNN algorithm through X-rays. And hence to identify the fluorescent antibody through most reliable techniques for distinguishing SARS-CoV-2 contamination was easily identify. Further studies are yet to be addressed to reveal the epidemiological, immunological, genomic, and proteomic importance of the original infection that could support the execution of process for COVID-19 finding.

7. REFERENCES

- [1] Ajesh F, Ravi R, G R, (2020) Early diagnosis of glaucoma using multifeature analysis and dbn based classification. J Ambient Intell Human Comput. <https://doi.org/10.107/s12652-020-01771-z>
- [2] Bajaj N, Granwehr BP, Hanna EY, Chambers MS (2020) Salivary detection of sars-cov-2 (covid-19) and implications for oral healthcare providers. Head & Neck
- [3] Bishop CM (2006) Pattern recognition and machine learning. springer, Berlin
- [4] Chen F, Liu Z, Zhang F, Xiong R, Chen Y, Cheng X, Wang W, Ren J (2020a) First case of severe childhood novel coronavirus pneumonia in china. Zhonghua er ke za zhi Chinese Journal of Pediatrics 58:E005–E005
- [5] Chen J, Wu L, Zhang J, Zhang L, Gong D, Zhao Y, Hu S, Wang Y, Hu X, Zheng B, et al. (2020b) Deep learning-based model for detecting 2019 novel coronavirus pneumonia on high-resolution computed tomography: a prospective study. medRxiv

- [6] Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y et al (2020c) Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet* 395(10223):507–513
- [7] Dataset (2020) Covid data. https://drive.google.com/uc?id=1coM7_x3378_f-Ou2l6_Pg2wl_daOI7_Dntu1_a, online: accessed 22 April 2020
- [8] Di Gennaro F, Pizzol D, Marotta C, Antunes M, Racalbuto V, Veronese N, Smith L (2020) Coronavirus diseases (covid-19) current status and future perspectives: a narrative review. *Int J Environ Res Pub Health* 17(8):2690
- [9] Documentation K (2018) Imagedatagenerator class. <https://keras.io/preprocessing/image/#imagedatagenerator-methods>, online: accessed 28 April 2020
- [10] Gozes O, Frid-Adar M, Greenspan H, Browning PD, Zhang H, Ji W, Bernheim A, Siegel E (2020) Rapid ai development cycle for the coronavirus (covid-19) pandemic: Initial results for automated detection & patient monitoring using deep learning ct image analysis. *arXiv preprint arXiv:200305037*
- [11] Hajian-Tilaki K (2013) Receiver operating characteristic (roc) curve analysis for medical diagnostic test evaluation. *Caspian J Int Med* 4(2):627
- [12] He K, Zhang X, Ren S, Sun J (2016) Deep residual learning for image recognition. In: *Proceedings of the IEEE conference on computer vision and pattern recognition*, pp 770–778
- [13] He T, Zhang L, Guo J, Yi Z (2020) Multilabel classification by exploiting data-driven pair-wise label dependence. *Int J Intell Syst*
- [14] Hinton GE, Srivastava N, Krizhevsky A, Sutskever I, Salakhutdinov RR (2012) Improving neural networks by preventing coadaptation of feature detectors. *arXiv preprint arXiv:12070580*
- [15] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X et al (2020a) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet* 395(10223):497–506
- [16] Huang JS, Chen BQ, Zeng NY, Cao XC, Li Y (2020b) Accurate classification of ecg arrhythmia using mowpt enhanced fast compression deep learning networks. *J Ambient Intell Human Comput*. <https://doi.org/10.1007/s12652-020-02110-y>
- [17] Imtiaz Z, Umer M, Ahmad M, Ullah S, Choi GS, Mehmood A (2020) Duplicate questions pair detection using siamese malstm. *IEEE Access* 8:21932–21942
- [18] Jackson D, Anders R, Padula WV, Daly J, Davidson PM (2020) Vulnerability of nurse and physicians with covid-19: Monitoring and surveillance needed. *J Clin Nurs*
- [19] Jiménez-Valverde A (2012) Insights into the area under the receiver operating characteristic curve (auc) as a discrimination measure in species distribution modelling. *Global Ecol Biogeogr* 21(4):498–507
- [20] Jin S, Wang B, Xu H, Luo C, Wei L, Zhao W, Hou X, Ma W, Xu Z, Zheng Z, et al. (2020) Ai-assisted ct imaging analysis for covid-19 screening: Building and deploying a medical ai system in four weeks. *medRxiv*
- [21] Kaggle (2020) Covid-19 patients lungs x ray images 10000. <https://www.kaggle.com/nabeehsajid917/covid-19-x-ray-10000-images>, online: accessed 20 April 2020
- [22] Kanne JP (2020) Chest ct findings in 2019 novel coronavirus (2019-ncov) infections from wuhan, china: key points for the radiologist
- [23] Kim H (2020) Outbreak of novel coronavirus (covid-19): What is the role of radiologists?
- [24] Krizhevsky A, Sutskever I, Hinton G (2012) Imagenet classification with deep convolutional neural networks. *Neural Inform Process Syst* 25
- [25] Krzanowski WJ, Hand DJ (2009) ROC curves for continuous data. *Crc Press*