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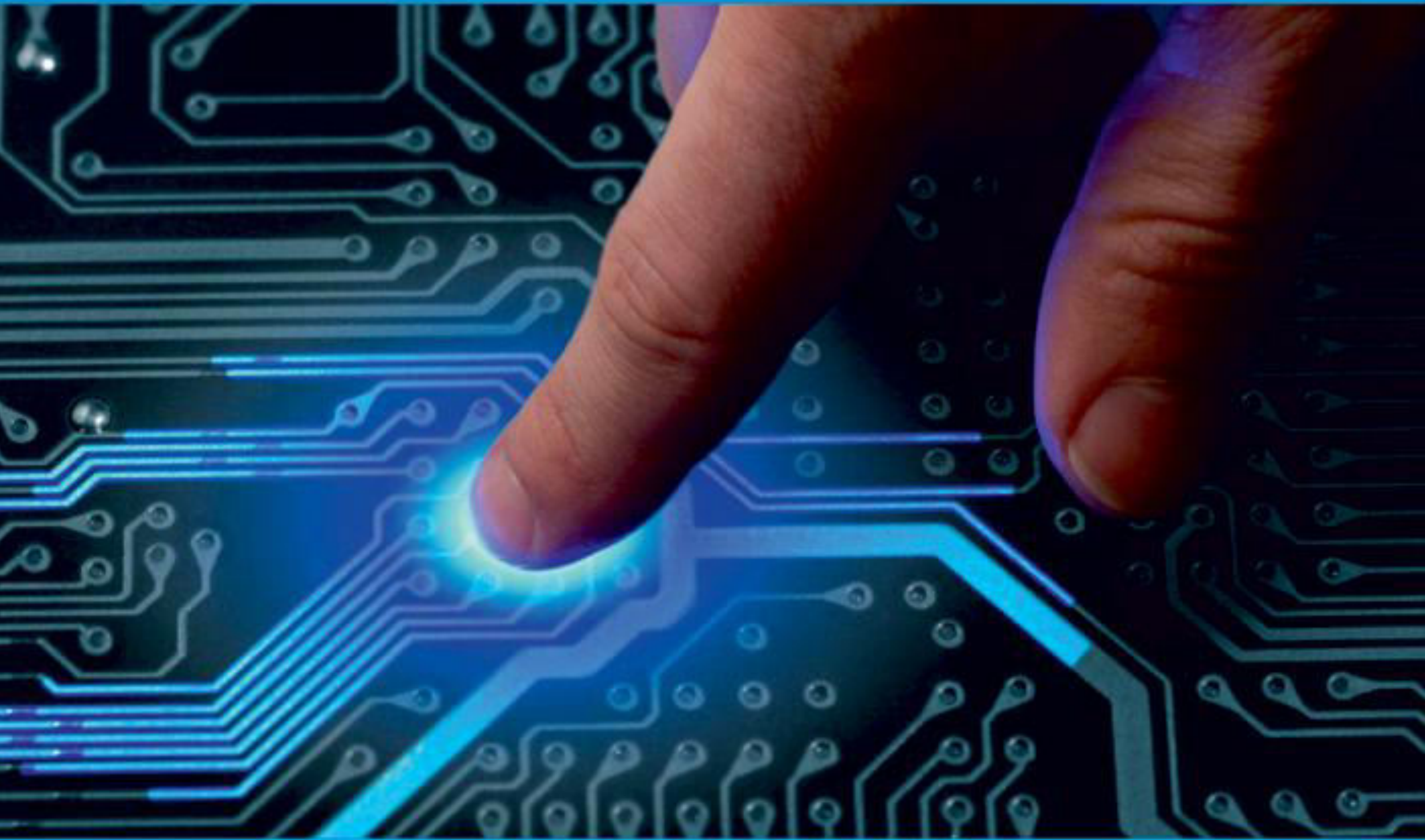

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Automated COVID-19 Detection from Chest Images Using CNN

Vinutha H[1], Shivashankar Y S[2], Siddu H Gudagudi[3], Shwetha B S[4], Sharath B S[5]

Assistant Professor, Dept. of Computer Science & Engineering, Dr.Ambedkar Institute of Technology, India[1]

UG Students, Dept. of Computer Science & Engineering, Dr.Ambedkar Institute of Technology, India[2,3,4,5]

ABSTRACT: The new coronavirus 2019 (COVID-2019) originally surfaced in Wuhan, China, in December 2019 and quickly spread over the world, becoming a pandemic. It has had disastrous consequences for people's daily life, public health, and the global economy. It is vital to find positive cases as soon as possible in order to prevent the pandemic from spreading further and to treat those who have been afflicted as promptly as feasible. Because there are no accurate automated toolkits accessible, the demand for supplemental diagnostic tools has grown. According to recent studies gained using radiological imaging techniques, such images convey important information about the COVID-19 virus. Advanced artificial intelligence (AI) approaches combined with radiological imaging may be useful in detecting this disease accurately. In this study, a new model for automatic COVID-19 detection using raw chest X-ray images is presented. The proposed model is developed to provide accurate diagnostics for binary classification (COVID vs. No-Findings) and multi-class classification (COVID vs. No-Findings vs. Pneumonia). Our model produced a classification accuracy of 98.08% for binary classes and 87.02% for multi- class cases.

KEYWORDS: Contactless COVID-19 detection, CNN based chest X-Ray image classification, Deep neural network
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I. INTRODUCTION

COVID-19 presentation, which began with the reporting of unknown causes of pneumonia in Wuhan, Hubei province of China on December 31, 2019, has rapidly become a pandemic. The disease is named COVID-19 and the virus is termed SARS-CoV-2. This new virus spread from Wuhan to much of China in 30 days. The United States of America, where the first seven cases were reported on January 20, 2020, reached over 300,000 by the 5th of April 2020 [2,3, 4, 5,6] . Most coronaviruses affect animals, but they can also be transmitted to humans because of their zoonotic nature. Severe acute respiratory syndrome Coronavirus (SARS-CoV) and the Middle East respiratory syndrome Coronavirus (MERS-CoV) have caused severe respiratory disease and death in humans. The typical clinical features of COVID-19 include fever, cough, sore throat, headache, fatigue, muscle pain, and shortness of breath.

A real-time reverse transcription-polymerase chain reaction is the most prevalent test technique currently utilised for COVID-19 diagnosis (RT-PCR). Early diagnosis and treatment of this condition rely heavily on chest radiological imaging such as computed tomography (CT) and X-ray.Even if negative findings are obtained, symptoms can be discovered by evaluating radiological imaging of patients due to the poor RT-PCR sensitivity of 60%–70%. According to the researchers, CT is a sensitive approach for detecting COVID-19 pneumonia and can be used as a screening tool in conjunction with RT-PRC. CT findings are evaluated over a long period of time after the onset of symptoms, and most patients have a normal CT throughout this time.

Because Chinese clinical centres lacked sufficient test kits at the start of the pandemic, which are also producing a high proportion of false-negative results, doctors are being pushed to make diagnoses only on the basis of clinical and chest CT findings.CT is commonly employed for COVID-19 identification in countries like Turkey, where there were few test kits available at the start of the epidemic. Combining clinical imaging features with laboratory results, according to the researchers, could aid in the early diagnosis of COVID-19.Although laboratory testing, such as reverse transcription polymerase chain reaction (RT-PCR), is the gold standard for clinical diagnosis, false negatives can occur. Furthermore, in a pandemic situation, a lack of RT-PCR testing resources may cause delays in clinical decision-making and treatment. Chest X-ray imaging has proven a significant tool in such situations.

II. RELATED WORK

Diagnostic information can be found in radiologic pictures taken from COVID-19 instances. Changes in chest X-ray and CT imaging have been observed in certain investigations prior to the onset of COVID-19 symptoms. Investigators

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have made significant breakthroughs in COVID-19 imaging investigations. Reports on the imaging findings are starting to emerge. Multilobar involvement and circular as well as peripheral airspace opacities were described in the biggest case series of chest imaging in 21 patients. Ground glass (57 percent) and mixed attenuation (29 percent) were the most generally described opacities, which are similar to our presented situations. Given the predominance of ground-glass opacities, chest CT is more sensitive, and findings can be missed on radiographs. Notably, confirmed cases can have normal chest CT as well. Imaging findings share several similarities with previously described findings in SARS-CoV and MERS-CoV. In conclusion, imaging findings can be nonspecific for a particular infection, but in the context of a travel history or exposure, the presence of nodular and peripheral ground-glass opacities should alert the radiologists to this possibility [7] . The chest X-ray (CXR) usually shows bilateral infiltrates but may be normal in early disease. CT imaging generally shows infiltrates, ground glass opacities and sub segmental consolidation. It is also abnormal in asymptomatic patients/ patients with no clinical evidence of lower respiratory tract involvement. In fact, abnormal CT scans have been used to diagnose COVID-19 in suspect cases with negative molecular diagnosis; many of these patients had positive molecular tests on repeat testing [8 , 9 , 10].There are several pre-trained CNN models available for robust image classification which include ResNet, DenseNet, SqueezeNet, Xception etc.

III. PROPOSED ALGORITHM

In this project, X-ray images obtained from two different sources were used for the diagnosis of COVID-19. A COVID-19 X-ray image database was developed by Cohen JP using images from various open access sources. This database is constantly updated with images shared by researchers from different regions. At present, there are 127 X-ray images diagnosed with COVID-19 in the database.

Following is the steps that we have followed during the implementation:
1. Sample an open source dataset of X-ray images for patients who have tested positive for COVID-19
2. Sample ―normal(i.e., not infected) X-ray images from healthy patients
3. Train a CNN to automatically detect COVID-19 in X-ray images via the dataset we created.
4. Evaluate the results from an educational perspective

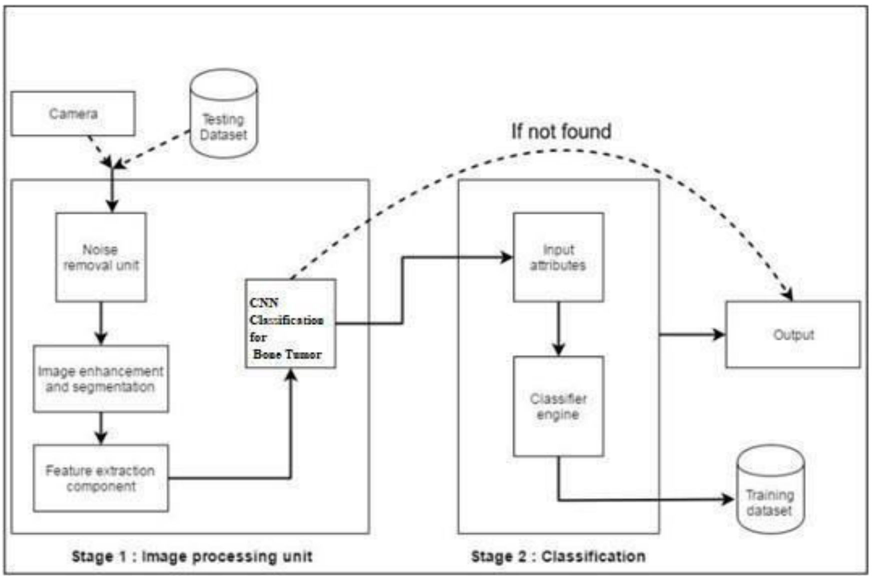

Figure 1. Proposed Architecture

The framework can be comprehensively sorted into following significant stages:
Pre-Processing of image: In this process, the photo is standardized by clearing the commotion, as it may confuse the evaluation. Similarly, the image given as the information may not be of standard size as required by the figure, so it is vital that the image size needed is obtained.

Classifier to classify the COVID: The classifier used here is the last layer of the system which gives the true probability of each experience. The project involves two major parts Image preparation unit and grouping unit. The object processing system enhances the image by removing the clatter and noisy bits. The Lungs and the image will then

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be isolated into different segments to isolate the Lung from running the mill after the image features are evacuated to check whether or not the Lung is contaminated.

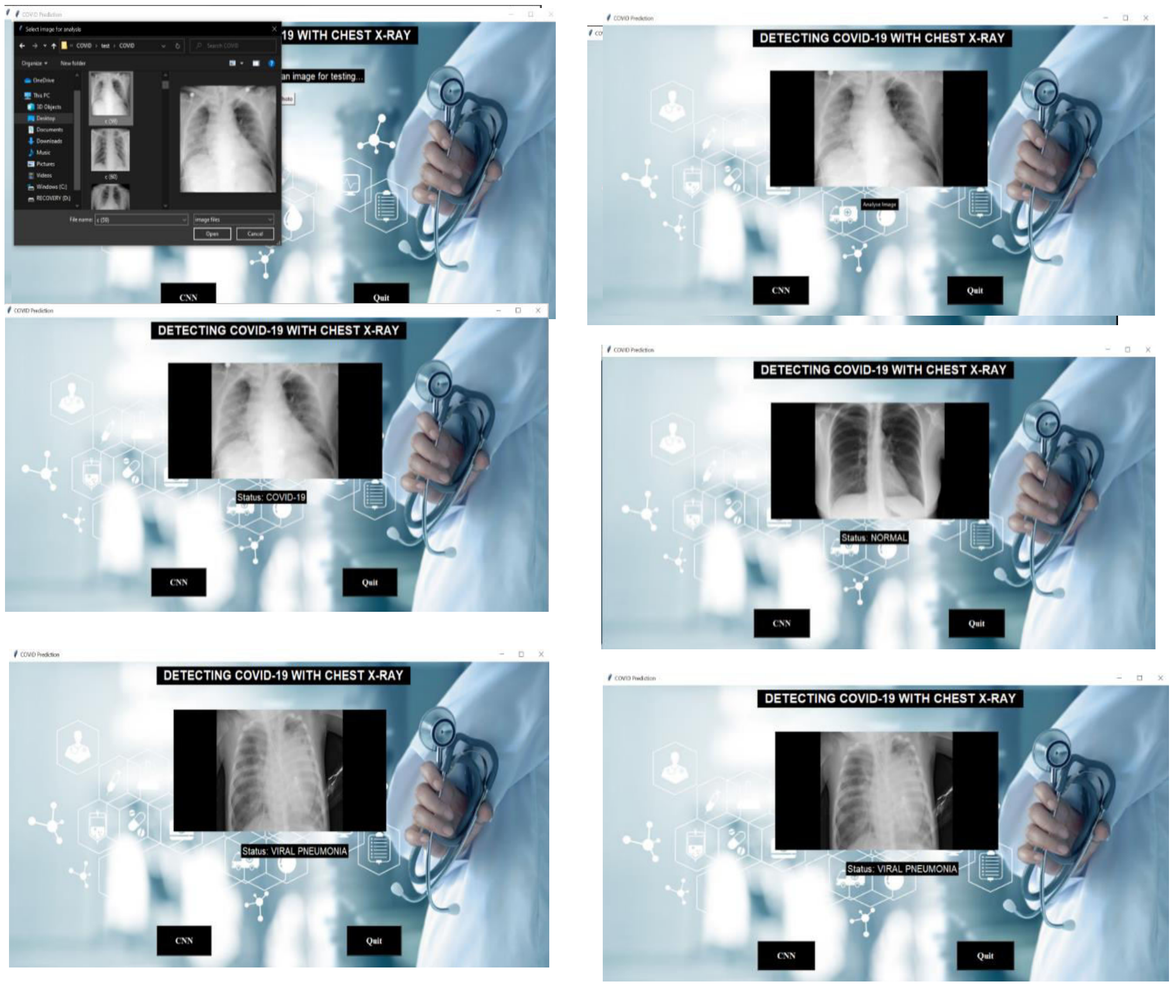
III. RESULTS

The CNN model is trained with chest x-ray images from dataset. The CNN model is trained with 300 X-Ray images in 80:20 ratio. The performance analysis results are as follows:

Table -1: Performance analysis of X-ray images

Sl. No	1
Dataset	Chest X-Ray images
Data Set Split	Total=300 Training=80% Testing=20%
Error Rate (ERR)FP+FN P+N	6%
Precision TP FP+FN	0.94
Accuracy =(1-ERR)	94%

Screenshots:



IV. CONCLUSION AND FUTURE WORK

Using the dice coefficient on the training set, the model had a 65.7 percent accuracy. On the training set, the dice coefficient is significantly lower, but the confusion matrix produces a high true and false positive rate on a set with both positive and negative samples. This shows that the model is quite good at differentiating between X-Ray slices with no

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COVID nodules and those with COVID nodules.I believe that accuracy could be improved with additional hyper parameter adjustment and model training. When doctors identify small nodules (less than 3mm), current practise advises them to wait 6-12 weeks before rescanning for signs of growth. A tumour can double in size and turn into a more advanced type of COVID depending on the tumour. It is also important to note that the second most frequent diagnosis is small tumors. The project demonstrates that it would be possible for Doctor's to use CNN applications to aid their decision making process regarding whether a patient with a small tumour should perform a biopsy or rescan in a few weeks which to a patient could mean early treatment and a better prognosis.

Doctors in this sector are susceptible to observer fatigue as a result of examining so many X-Ray images. According to the research, observer weariness increases the chance of doctors making mistakes while assessing these images. Many images in a X - Ray also are irrelevant to Doctors e.g. for 200-300 images only 3 scans would show COVID depending on the stage of the patient. Although this feature was not implemented on the website, a more efficient CNN model would be capable of alleviating these additional challenges.

REFERENCES

[1] S. R. Abdani, M. A. Zulkifley and N. Hani Zulkifley, "A Lightweight Deep Learning Model for COVID-19 Detection," *2020 IEEE Symposium on Industrial Electronics & Applications (ISIEA)*, 2020, pp. 1-5, doi: 10.1109/ISIEA49364.2020.9188133.

[2]Wu F., Zhao S., Yu B. A new coronavirus associated with human respiratory disease in China. Nature. 2020;579(7798):265–269.

[3]Huang C., Wang Y. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395(10223)

[4]World Health Organization . World Health Organization (WHO); 2020. Pneumonia of Unknown Cause–China. Emergencies Preparedness, Response, Disease Outbreak News. [Google Scholar]

[5]Wu Z., McGoogan J.M. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. Jama. 2020;323(13):1239–1242. [PubMed] [Google Scholar]

[6]Holshue M.L., DeBolt C. First case of 2019 novel coronavirus in the United States. N. Engl. J. Med. 2020;328:929–936. [PMC free article] [PubMed] [Google Scholar]

[7]Kong W., Agarwal P.P. Chest imaging appearance of COVID-19 infection. Radiology: Cardiothoracic Imaging. 2020;2(1) [Google Scholar]

[8]Singhal T. A review of coronavirus disease-2019 (COVID-19) Indian J. Pediatr. 2020;87:281– 286. [PMC free article] [PubMed] [Google Scholar]

[9]Zu Z.Y., Jiang M.D., Xu P.P., Chen W., Ni Q.Q., Lu G.M., Zhang L.J. Coronavirus disease 2019 (COVID-19): a perspective from China. Radiology. 2020 doi: 10.1148/radiol.2020200490. In press. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[10]Kanne J.P., Little B.P., Chung J.H., Elicker B.M., Ketai L.H. Essentials for radiologists on COVID-19: an update—radiology scientific expert panel. Radiology. 2020 doi: 10.1148/radiol.2020200527. In press. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

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