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Covid-19 Detection in Chest X-ray Images Using Artificial Intelligence: An Early Review

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ABSTRACT— In 2019, the entire planet is experiencing a health emergency as a result of a newly discovered corona virus (COVID-19). Nearly 196 countries are affected by COVID-19, with the United States, Italy, China, Spain, Iran, and France having the most active cases. The difficulties that medical and healthcare departments are having in detecting COVID-19. Several artificial intelligence-based systems have been developed. are intended to detect COVID-19 automatically using chest x-rays. this paper takes through the various methods for detecting COVID-19 as well as the challenges we're up against. To prevent the virus from spreading via touch, an automatic detection system must be created. Several deep learning architectures, such as ResNet, are used to detect COVID-19. Inception, Google Net, and so on. Both of these methods diagnose pneumonia in subjects, but it's difficult to tell if the pneumonia is caused by COVID-19 or by another bacterial or fungal infection.

KEYWORDS- ResNet, Inception, GoogleNet, COVID-19, Artificial Intelligence, Chest X-rays, Deep Learning.

I. INTRODUCTION

In December of this year, the COVID-19 pandemic broke out in Wuhan, China. Because of its contact-transmitted behaviors, it quickly became a global health problem. COVID-19 is caused by a virus known as SARS-Cov-23 (Severe Acute Respiratory Syndrome Corona Virus 2). A wide family of these viruses causes a variety of diseases, including the common cold and Middle East Respiratory Syndrome. COVID-19, a new member of the corona virus family, was discovered in 2019 and has never been seen in humans. COVID-19 is referred to as a zoonotic disease because it is transmitted from an animal to a person, such as a bat4, similar to the SARS-CoV virus, which is spread by cats, and MERS-CoV, which is spread by dromedaries. COVID-19 is thought to spread quickly due to respiratory transmission and physical contact. According to the World Economic Forum, people with no or slight symptoms are the main cause of the disease spreading. One out of every four subjects has no signs or symptoms of COVID-19, even though he or she is infected. Nearly 82 percent of infected people have mild to no symptoms, while the rest are in critical condition.

Approximately 1,359,010 cases have been recorded, with 75,901 deaths and 293,454 recoveries as of April 7, 2010. In the current state of infection, statistics show that 95% of infected subjects have a chance of recovery and 5% have a mortality rate, as shown in figure 28. Dyspnea, fever, and cough are symptoms of infection, and in a more serious situation, this infection may lead to death. Due to higher exposure, is more common in men than in women, and no deaths have been recorded in children aged 0 to 9 years.

When compared to healthy subjects, Pneumonia caused by COVID-19 causes respiratory problems to spread faster. Even after precautionary measures were taken, the pandemic spread quickly in developing countries. The number of infected subjects increased exponentially from March 19 to March 31st, and the demand for intensive care units increased in lockstep8. China's government COVID-19 will be published if the revised guidelines are published.

Reverse Transcript or Polymerase Chain Reaction (RT-PCR) is a basic predictor and is diagnosed by gene sequencing from blood samples. The method of gene sequencing using RT-PCR is time-consuming, and the patient should be admitted to the hospital right away. Because the subjects who tested positive for COVID-19 could have pneumonia, COVID-19 can easily be detected

using an automated device, and the concerned department should consider isolating and treating the subjects right away.

If a subject survives the critical stage, he or she may have permanent lung damage. COVID-19, like SARS, causes holes in the lungs that are not recoverable, according to the World Health Organization. 4 The technique of computed tomography of the chest can also be used to diagnose pneumonia. A framework based on artificial intelligence for the automated detection of COVID-19 may be useful in monitoring. quantifying and differentiating a non-contact subjective communication. A deep learning technique is also being developed for extracting COVID-19 graphical characteristics from CT images to provide a more rapid and accurate diagnosis than pathogenic testing and save time10. COVID-19 is related to SARS-CoV and MERS-CoV. Scientific evidence suggests that COVID-19 can be detected SARS-Cov.

II. METHODOLOGY AND MODULES

In this system, sensors detect open slots, image processing identifies a vehicle, and the parking fee for each vehicle is calculated based on the amount of time the vehicle spends in the parking area.

- DataSet of X-ray images
- Preprocessing
- Training/Testing Splits:

COVID-19 was diagnosed using X-ray images obtained from two separate sources in this study. Cohen JP created a COVID-19 X-ray image database utilizing images from various open access sources. This archive is maintained regularly with photographs shared by researchers from around the world. There are currently 127 X-ray images that have been diagnosed with COVID19 found in the database Figure 1 depicts a few COVID-19 cases from the database as well as expert results.

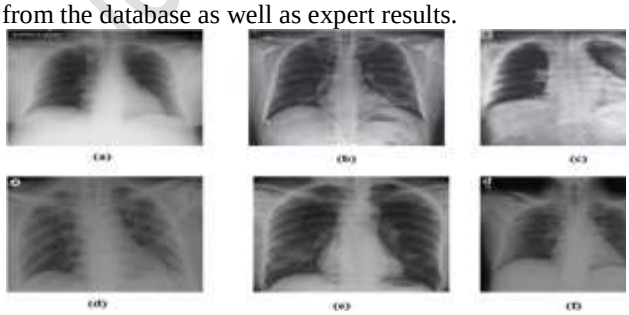


Fig.1. A few COVID-19 cases from the database as well as expert results.

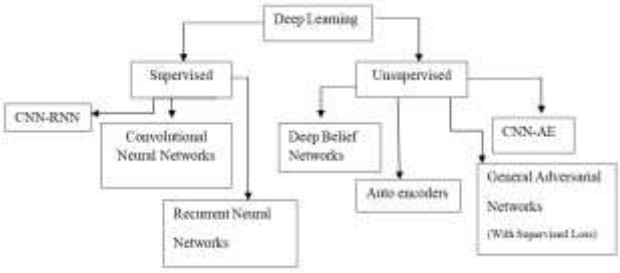
Here are a few COVID-19 cases and results are broken down by dataset:
(a) Cardio-vasal shadow within normal limits;
(b) Increasing left basilar opacity apparent, raising concerns regarding pneumonia;
(c) Progressive infiltrate and consolidation;
(d) Ground-glass opacities in both lower lobes and small consolidation in the right upper lobe.
(e) Infection causes opacities in the right infrahilar airspace, and
(f) Progression of bilateral perihilar infiltration and ill-defined patchy opacities.

In the database, there are 45 female cases and 83 male cases that are positive. There isn't enough information for all of the patients in this dataset. The average age of 26 COVID-19 positive subjects is approximately 55 years old, according to the age information given. For regular and pneumonia photos, Wang et alChestX-ray8. the database was also used. To stay away from this, avoid the unbalanced data problem, we used 500 no-findings and 500 pneumonia class frontal chest X-ray images randomly from this database.

Preprocessing

The provided paths to images in the dataset directory to load files. Then it goes through the processes for each image Path.
From the road, the classmark will be extracted (either covid or normal).
Preprocess the image by converting it to RGB channel ordering and resizing it to 224224 pixels,
So it's ready for our Convolutional Neural Network to update the data and labels lists correspondingly, then convert all data and labels to NumPy array format, scaling pixel intensities to the range [0, 1].

After that, to build the training/testing splits by one-hot encoding labels.



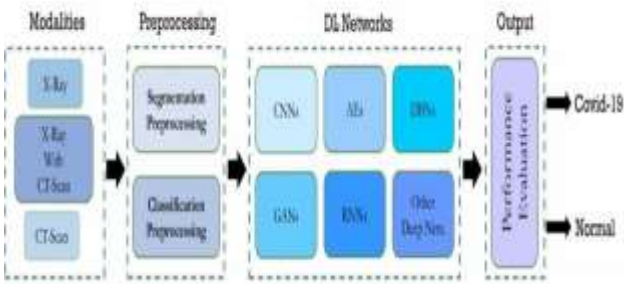


Fig.2. Block diagram for COVID-19 detection using DL technique.

Training/Testing Splits:

The data split after pre-processing all of the images in the dataset, reserving 80% of the data for training and 20% for research. Then performing the data augmentation by setting random image rotation setting to 15 degrees clockwise or anti-clockwise to ensure that model get the generalizes.

Model Making:

Artificial intelligence has been transformed with the introduction of deep learning technologies. The term "deep" refers to the network's size expanding as the number of layers increases. The structure is named after the mathematical operator convolution.

A convolution layer extracts features from the input with the filters it applies, a pooling layer reduces the size for computational efficiency, and a completely connected layer, which is a neural network, are all part of a standard CNN structures internal parameters of a CNN model are changed to accomplish a particular task, such as classification or object recognition, by combining one or more of these layers.

III. TECHNIQUE USED

ResNet

A residual neural network (ResNet) is a form of artificial neural network (ANN) that is based on pyramidal cell constructs in the cerebral cortex. Skip links, or shortcuts, are used by residual neural networks to hop over certain layers.

Hardware Requirements

The hardware specifications may serve as the basis for a contract for the system's implementation, so they should be a thorough and consistent description of the entire system. They are used as a starting point for device design by software engineers. It should be about what the method does, not how it is implemented.

- PROCESSOR: DUAL CORE 2 DUOS.
- RAM: 4GB DD RAM
- HARD DISK: 250 GB

Software Requirements:

The program specifications document is the system's specification. It should include a requirement description as well as a requirement specification. It's more of a list of what the system can do than a description of how it should do it. The software specifications serve as the foundation for the creation of the software requirements specification It can be used to estimate costs, schedule team events, complete assignments, and track progress Keeping track of the teams and their success in the development process Front End: Spyder3

- Operating System: Windows 7/8/10
- Platform: Spyder3
- Programming Language: Python, HTML

Development Tools:

Python is a scripting language that is high-level, interpreted, interactive, and object-oriented. Python is designed to be a language that is easy to understand. It makes use of while other languages use punctuation, English makes extensive use of keywords and has fewer syntactical constructions. Spyder3 is a cross-platform, open-source integrated development environment for scientific Python programming.

IV. SYSTEM ARCHITECTURE

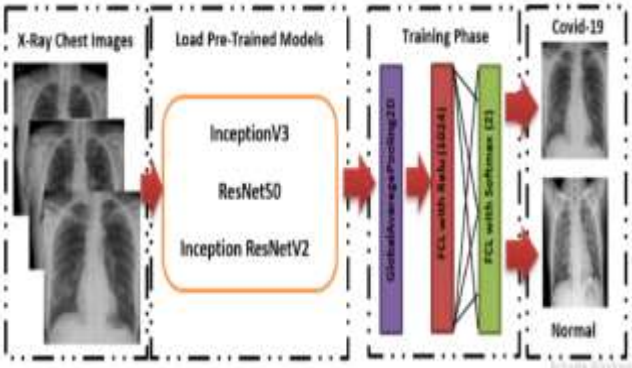


Fig.3. System Architecture

Explanation:

The method of computed tomography of the chest may also be used to detect pneumonia. A COVID-19 detection device based on artificial intelligence may be useful in tracking, quantifying, and distinguish contactless subjective communication The extraction of graphical characteristics of COVID-19 from CT images is also developed using a deep learning technique. provide a quick and precise diagnosis as compared to pathogenic testing and save critical time.

COVID-19 is related to SARS-CoV and MERS-CoV. Scientific evidence suggests that SARS-CoV and MERS-CoV can be detected using chest x-ray and CT images. Researchers used feature extraction and data mining techniques to classify MERS-CoV and SARS-CoV-caused pneumonia. X-ray devices are often used to scan the body for broken bones, cancers, and other abnormalities.

V. RESULTS

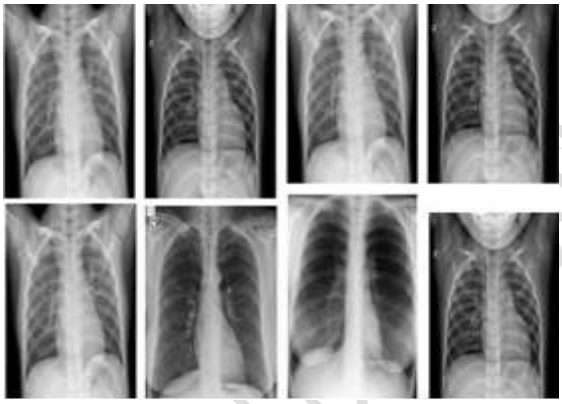


Fig.4. Representative Chest X-ray images of normal

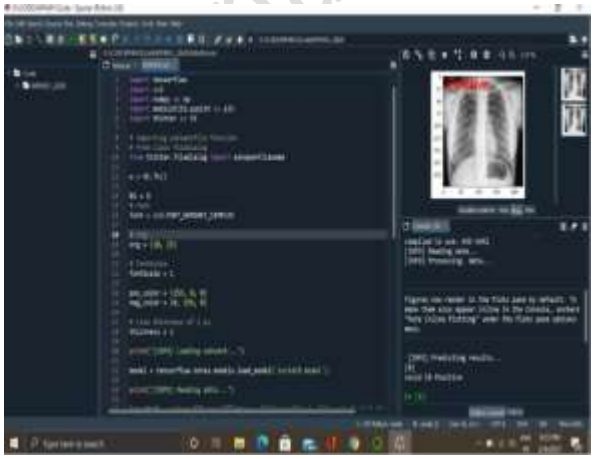


Fig.5. Positive Case

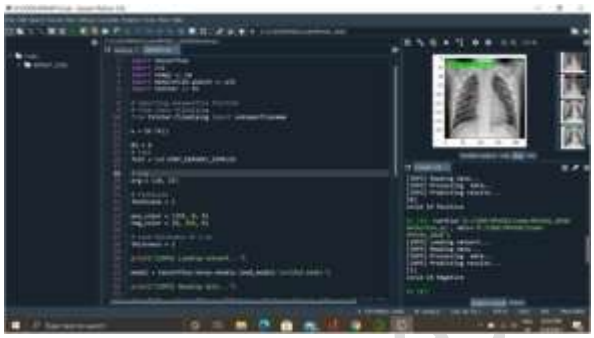


Fig.6. Negative Case

Artificial Intelligence (AI) will provide sophisticated solutions to the challenges posed by the pandemic COVID-19. It is possible to overcome challenges using human experience, intellect, and imagination, as well as updated technology. they tried multiple deep learning methods, including ResNet50, InceptionV3, and InceptionResNetV2. Furthermore, for the proposed dataset, the ResNet50 model has the highest accuracy of 98 percent, while InceptionV3 and Inception-ResNetV2 have 97 percent and 87 percent, respectively.

VI. CONCLUSION

The proposed AI-based approaches in the literature for COVID-19 detection display promising results, such as VGG19 (98%) accuracy, ResNet (96%) accuracy, ResNet50 (95%) accuracy, and InceptionV3 (96%) accuracy. In most cases, the databases used to contain around 50-100 x-ray images of both COVID- 19-infected and healthy subjects. Binary classification methods were used in all of the proposed approaches. To summarise the current research, COVID-19 is difficult to combat due to its enigmatic behavior and uncertain biological origin. Precautionary steps and lessons learned from other public health outbreaks, such as SARS-CoV and MERS-CoV, may be tried. Wearing masks, social distancing, isolation, sanitation, and quarantine will also help to minimize the chances of a pandemic spreading. Convalescent plasma is also considered a potential therapy for COVID-19.

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