Detection of COVID-19 Using Deep Learning Technique

Aanchal Dusija

Meghnad Desai Academy of Economics

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I. INTRODUCTION

COVID-19 is an infectious disease caused by a recently discovered coronavirus. The outbreak commenced in December 2019 in the city of Wuhan, China which soon turned into a pandemic due to its contagious nature. It is also called as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2).

Coronaviruses (CoV) are a family of hundreds of viruses that usually infect animals like chickens, bats, camels, cats. These viruses within the animals can mutate permitting them to transmit the virus within them to other species leading to a spill-over. It has been observed that the virus is mainly attacking the respiratory system in humans, ranging from the common cold to more deadly diseases like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).

The symptoms of COVID-19 can be very mild, some people may not show any symptoms at all but can infect other people. It is not as deadly as SARS and MERS. The most common symptoms of COVID-19 are fever, dry cough, and fatigue. Other symptoms that are less common in nature are headaches, nasal congestion, sore throat, loss of taste and smell, conjunctivitis, and discoloration of fingers or toes.

Around 80% of people recover without being hospitalized. The rest become seriously ill and have difficulty in breathing. Usually, older people having other underlying medical problems like high blood pressure, heart and lung problems, diabetes, or cancer are at a higher risk of developing a serious illness. However, anyone can get the virus and get seriously ill.

SARS, which was first detected in November 2002, bears several similarities to COVID-19. Both the coronaviruses are believed to have originated from bats, jumping to humans via an intermediate animal host. According to the WHO, SARS punched holes in the lungs, giving them "a honeycomb-like appearance"—and these lesions are present in those afflicted by a novel coronavirus, too. However, the mortality rates for SARS are higher. In 2012, there was another outbreak of a newly found coronavirus called the Middle East Respiratory Syndrome (MERS). The very first case was found in Saudi Arabia. The difference between SARS, MERS, and COVID-19 is that R0 for SARS is 3, R0 for MERS is less than 1 but the R0 for COVID-19 is 5, meaning that every infected person is likely to infect 5 other people. This shows how the infectious nature of COVID-19.

COVID-19 begins and ends in patients' lungs, because like the flu, coronaviruses are respiratory diseases. They spread typically when an infected person coughs or sneezes, spraying droplets that can transmit the virus to anyone in close contact. Coronaviruses also cause flu-like symptoms: Patients might start with a fever and cough that progresses to pneumonia or worse.

COVID-19 is detected in the upper and lower respiratory specimens of the individuals with the help of RT-PCR (real-time transcription-polymerase chain reaction) test. Since the origin of the outbreak, the availability and quantity of the testing kits have been low. The stability and reproducibility if the detection kits are being questioned. These factors play a determinant role in the accuracy of test results. In several areas, the accuracy of the kits has found to be only 50% and has to hence be repeated several times before the cases can be confirmed.

X-ray images of the chest can be used to diagnose COVID-19 with technological advancements made in the field of machine learning. One of the most important methods of machine learning is deep learning. Deep learning focuses on extracting features and classifies images which are applied in detecting objects or in medical cases, classification of tasks. Machine learning and deep learning have become established disciplines in applying artificial intelligence to mine, analyze, and recognize patterns from data. [1]

With the recent innovation in Artificial Intelligence (AI), COVID-19 can be detected, quantified, and monitored and making it easier to isolate patients who have been infected for faster treatment. Chest x-rays scan the infections present in the lungs of the patient. It is a faster, easier, cheaper, and less harmful method of testing patients and hence must be used. With the increasing mortality rates all thanks to COVID-19, Chest X-rays must be implemented by all countries on an urgent basis. Although this technological advancement seems helpful, the images of various types of pneumonia are similar and overlap with other infectious and inflammatory lung diseases making it difficult to distinguish between COVID-19 from other viral cases of pneumonia.[3]

In the study, a prediction of the COVID-19 detector will be modeled using Convolutional Neural Network (CNN) based on pre-trained models and Chest x-rays images. CNN helps in the extraction of the features by enhancing low-light images with the help of training data. In the early stages of COVID-19, bilateral distribution of patchy shadows and ground-glass opacity has been observed which are similar to the viral pneumonia symptoms with slight

differences. With the aid of the CNN model, unique features can be identified which are difficult for visual recognition.[4]

Despite the limitations of the current study, which are related to the data availability limitations, opens the horizons for more specialized research into the possible existence biomarkers related to the Covid-19 disease in X-ray images. The possible significance of those biomarkers can be confirmed or denied by other feature extraction techniques such as Radiomics in future research.[2]

II.   LITERATURE REVIEW

ABCD

III. DATA

EFGH

IV. METHODOLOGY

IJKL

V. ANALYSIS

MNOP

VI.   RESULTS

QRST

VII. CONCLUSION

UVWX

VIII.   REFERENCES

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