Chapter 4
Neural Architecture Search Network for the Diagnosis of COVID From the Radiographic Images

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ABSTRACT

The outbreak of human-to-human transmissible COVID-19 has caused approximately 64,000 deaths around the world and keeps continuously increasing in an exponential order that has provoked global alarm. To control the spread of the disease, screening large numbers of suspected cases for appropriate quarantine and treatment measures is of higher priority. Since clinical laboratory testing with precise accuracy for huge samples in the infected region remains a great challenge that demands complementary diagnostic methods to combat the disease. In this work, the authors have identified a new AI-based deep learning framework named CORONATE based on neural architecture space search network (NASNET) as a competent choice that can extract graphical features from radiography images referred from the public dataset of x-ray images. This observation endorses that CORONATE model can administer a faster clinical diagnosis well ahead of pathogenic tests with higher accuracy and can empower the medical team to ensure a good control on the outbreak by saving critical diagnosis time.

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INTRODUCTION

Fast and precise screening of massive numbers of cases infected with viral pneumonia symptoms is highly demanded to initiate the treatment procedure and quarantine to control the spread of Corona Virus Disease (COVID-19). Pathogenic laboratory testing is the diagnostic gold standard, but it is time-consuming with significant false-positive results. Computed tomography (CT) and radiography have emerged as practical diagnostic tools for the preliminary identification of COVID-19. However, the intense and widespread outbreak of this disease and relatively inadequate radiologists instigate the need for a computer-aided diagnosis system. Although typical images may help early screening of suspected cases, the images of various viral pneumonia are similar and overlap with other infectious and inflammatory lung diseases. Advance Artificial intelligence technologies involving deep learning models might extract COVID-19's graphical features and provide a clinical diagnosis to accurately confirm suspected cases by screening the samples faster to identify the infected persons and start the quarantine and treatment procedures.

According to the World Health Organization (WHO) report, millions of people are affected by the coronavirus. There is a need to repeat the test for confirmation (Chu, 2019). As it is a fast-spreading pandemic, there is a demand for rapid and accurate diagnostic systems. Based on Fang's (Fang, 2020) study, lung radiology image-based diagnostics outperformed all other screening methods. With a strong suggestion, a diagnostic with radiological images could be a first step in monitoring the COVID (Li, 2020). Early diagnosis of 2019-nCoV is crucial for disease treatment and control. Compared to a Reverse transcription-polymerase chain reaction (RT-PCR), chest X-ray imaging may be a more reliable, practical, and rapid method to diagnose and assess COVID, especially in the pandemic region. Even though radiology images-based COVID diagnosis is faster than PCR, it requires the Artificial Intelligence (AI) based diagnosis to gain a rapid and accurate explication over the X-ray images (Kermany, 2018).

Respiratory illness includes H1NI viral infection, H5N1, Enterovirus, and viral pneumonia. Among these infections, coronavirus infection is severe as it mutates easily and rapidly. There are three basic types of coronavirus infection such as SARS, MERS, and COVID-19. There is a demand to discriminate these three viral infections from other viral pneumonia. This paper proposes the hyper graph-based approach to discriminate coronavirus infection from other virus infections in the lungs based on X-ray images.

Deep leaning and machine learning models are playing an important role in computer vision and pattern recognition. As the low radiation x-ray images are poor quality images, it is very difficult to infer the decision by radiologists. Hence, there is a demand for the deep learning technique to perfectly extract the in-depth