Using deep-learning algorithms for predicting the severity of lung infection in HRCT lung images for COVID-19 patients

Abstract

The ongoing COVID-19 pandemic has caused a bottleneck in the healthcare system around the world. The virus is highly contagious as it spreads through air droplets and person to person contact. The common method of diagnosis for such viruses is the RT-PCR (Reverse Transcription-Polymerase Chain Reaction) method. However, there are numerous issues when it comes to using RT-PCR as it is prone to producing a large number of false-negative and false-positive results because of its low sensitivity and specificity. Also, there are a limited number of RT-PCR testing kits available. In this scenario, medical imaging such as X-ray and Computed Tomography (CT) of the lung of the patients can be used as an alternative tool to make the diagnosis, as the disease primarily targets the epithelial cells of the lung. As CT scanners are widely available they are considered to be a functional and practical diagnostic tool. Artificial intelligence (AI) technologies can be used to strengthen the power of imaging tools and help medical specialists in analyzing hundreds of CT images quickly. Deep learning provides state-of-the-art performance for detection, segmentation, classification, and prediction. Hence, deep learning provides a convenient tool for diagnosing and predicting the severity of lung infection in CT images for COVID-19 patients. The dataset is a collection of 150,000 to 200,000 high resolution DICOM (Digital Imaging and Communication in Medicine) images of nearly 700 patients from the Department of Radiology, PSG IMSR, Coimbatore.

Objective: Design and develop Convolutional Neural Network (CNN) based deep learning models for automated detection of the key findings from CT scans, lung infection, and its pattern; percentage severity of lung infection.

References

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