COVID-19 DETECTION FROM CT IMAGES OF THE CHEST USING DEEP LEARNING APPROACH OF CONVOLUTIONAL NEURAL NETWORK (CNN)

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Abstract

COVID-19 is a highly contagious infectious disease that was declared a pandemic on March 11th, 2020. It has caused both healthcare and financial crisis all around the world by being spread out in 220 counties. COVID-19 is caused by SARS-CoV-2 whose nucleic acids are detected by the standard diagnostic method of detecting COVD-19. Early detection of the disease diagnosis is essential to control the transmission of the disease from an infected person. Medical imaging modalities have been commonly utilized to detect various lung pathologies effectively. Pure ground-glass opacities and consolidation opacities are the characteristic lung lesions in a COVID-19 patient. Due to the limitations of the standard diagnostic method (RT-PCR) of detecting COVID-19, an alternative diagnostic method (chest CT imaging) has been proposed by various existing works. Furthermore, it is found that CT (98%) imaging has higher sensitivity compared to RT-PCR (71%). On the other hand, deep learning methods including Convolutional Neural Networks (CNNs) are extensively applied in medical imaging to detect pathologies. In this project, the deep learning approach of CNN has been applied for detecting COVID-19 from chest CT images of the patients. The approach has been tested using the largest existing CT imaging database of COVID-19. Experimental results depict that the proposed model can achieve 93.89% accuracy of detecting COVID-19 through CT images with an F1 score, precision, and recall over 0.93, 0.93, and 0.92 respectively. Moreover, the false positive and false negative results are very low having a very high level of prediction value. The experimental observations suggest that this deep CNN-based approach would have a very high potential of being applied to detect COVID-19 faster with higher accuracy. The observations and the evaluations further suggest that the system has the potential to be improved to detect the severity of COVID-19 and various other lung diseases during the same attempt.