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Simultaneous Detection of Covid-19 and Its Pneumonia Using Multitask Learning

TLN Nadeeshana[1#] and WMKS Ilmini[1]

[1]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-cs-0014@kdu.ac.lk

With the rapid growth of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) or Covid-19 into a pandemic, quick and efficient alternative testing methods were needed. Although Viral Nucleic Acid tests are the primary and standard method of testing, due to the time-consuming process, and the lack of availability of test kits in certain areas have been problematic for the quick diagnosis of the disease. Therefore, using radiologic modalities such as chest X-rays and Computerized Tomography (CT) were studied due to their wider availability because of their usage in the diagnosis of other diseases. This research is based on chest X-rays, and tests the usage of deep multi-task convolutional neural networks (CNN) to detect both Covid-19 and Covid-19-related pneumonia conditions in a patient simultaneously. Usage of chest X-rays allows for wider availability in rural areas, where computerized tomography facilities are rare. Current results from separate custom CNN models with the same layer structure but different task-specific features, give an accuracy of 94% on Covid-19 detection and 90% accuracy on Covid-19 pneumonia detection. As a novelty, this paper suggests that a multitask learning-based CNN model in the same architecture would be viable to detect both conditions simultaneously from a single neural network. The simultaneous detection of Covid-19 and Covid-19 pneumonia in a patient is a further extension of traditional testing methods and allows for more effective treatments from the beginning.

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