The Virus is in the Details: Discovering Subtle COVID-19 Visual Features on Chest X-rays Using Machine Learning

Team

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A. PROJECT SUMMARY:

The widespread outbreak of Coronavirus disease (COVID-19) has led to this infectious disease being declared a pandemic by the World Health Organization. Viral nucleic acid detection using real-time polymerase chain reaction (RT-PCR) is currently the gold standard for COVID-19 detection. However, considering the limited availability of tests, and other factors such as false negatives due to low patient viral load, computed tomography (CT) imaging of the chest has been considered as an alternate reference standard. Despite its high sensitivity, CT is not being used as a first-line investigation because it poses significant challenges for infection control in CT suites. To minimize cross-infection, chest x-ray (CXR) has been considered as a triage tool. However, imaging changes apparent on CT during the early stages may not be visually discernible on CXR.

With this as a basis, we propose to develop machine learning tools for early identification of COVID-19 using CXR. This two-step process involves a 'pseudo-enhancement' of CXR by mapping infiltrates from matched CT onto CXR followed by transferring predictive information from later CXR to early CXR if supported by findings on CT. We also propose to use these early features to build an enhanced risk scoring system to predict disease progression.