Easy-to-Use AI System for Radiologists for COVID-19 Assessment from CT-Scans

Researchers have revealed a novel AI-based system for automated lung-lobe segmentation, that can achieve both COVID-19 identification and lesion categorisation from CT scans, which is key to evaluating damage to the lungs and making a prognosis.

This first-of-its-kind AI-powered pipeline, based on the deep-learning paradigm, uses a new segmentation module that automatically identifies lung parenchyma and lobes. The segmentation network is then combined with classification networks for COVID-19 identification and lesion categorisation. To test the system, the model's classification results were compared with those obtained by three expert radiologists on a dataset of 166 CT scans.

You might also like: Agfa HealthCare's Enterprise Imaging VNA solution is a modern, standards-based platform purpose-built on the latest technology. Health Management.org spoke to Christien Lefebvre, Global Program Manager, Enterprise Imaging VNA for Agfa HealthCare to discuss the VNA solution, what benefits it offers and why healthcare organisations and clinicians should transition to it. Learn more

In a recently published paper, they reported a sensitivity of 90.3% and a specificity of 93.5% for COVID-19 detection, similar or better than findings by the expert radiologists, and an average lesion categorisation accuracy of about 84%. Further, the prior segmentation of the lung and lobe improved classification performance by over 6 percent.

Investigators tested the AI-empowered software pipeline on multiple CT scans at the Spallanzani Institute in Italy, and showed that:

1. The segmentation networks are able to effectively extract lung parenchyma and lobes from CT scans, outperforming state of the art models.
2. The COVID-19 identification module yields better accuracy (as well as specificity and sensitivity) than expert radiologists.
3. The AI model learned automatically, and without any supervision, the CT scan features corresponding to the three most common lesions spotted in the COVID-19 pneumonia, i.e., consolidation, ground glass and crazy paving, which demonstrate its reliability in supporting the diagnosis by using only radiological images. This means that a positive patient can be differentiated from a negative one (both controls and patients with interstitial pneumonia tested negative to COVID) by simply evaluating the presence of those lesions in CT scans.
4. The AI models can be integrated into a publicly available user-friendly GUI to support AI explainability for radiologists. The GUI is able to process entire CT scans and report if the patient is likely to be affected by COVID-19, while showing the scan slices that support the decision.

The results obtained in this study both for COVID-19 identification and lesion categorisation pave the way for further improvements towards the implementation of an advanced COVID-19 CT/RX diagnostic system that is easily interpretable, robust and able to provide disease identification and differential diagnosis, as well as risk of disease progression.

Source: ScienceDirect

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