New system for analyzing thoracic CT scans with deep learning enables COVID-19 lesion detection

December 1 2021

Credit: CC0 Public Domain

A new automated system that involves deep learning technology enables the detection of COVID-19 lesion via the analysis of a computed

tomography (CT) scan. This system, described in a study published in the journal *Computers in Biology and Medicine*, has been carried out by researchers of the UB, the EURECAT Technology Centre of Catalonia, and the Computing Vision Center (CVC).

The study "has enabled us to verify the efficiency of the system as a support tool for decision-making for health professionals in their COVID-19 detection task, and for measuring the gravity, the extension and the evolution of the pneumonia caused by SARS-CoV-2, in the mid and long term," notes the principal researcher of the study, Giuseppe Pezzano, researcher at the UB and at EURECAT Digital Health Unit.

Specifically, the functioning of the system consists of "a first phase of lung segmentation with the CT scan to reduce the searching area," says Pezzano. "Then, an algorithm is used to analyze the lung area and detect the presence of COVID-19. If it tests positive, the image is processed to identify the areas that are affected by the disease," he adds.

The algorithm has been tested in 79 volumes and 110 sections of CTs that had detected COVID-19 infection, obtained in three open-access image repositories. The researchers achieved an average accuracy for the segmentation of lesions caused by the virus of about 99%, without false positives being observed during the identification.

The method uses an innovative way to calculate the mask of segmentation of medical images, which provided good results in the segmentation of nodules in the tomography images.

Some recently published studies "show that deep learning and computing vision algorithms have achieved a better precision than the experts' cancer detection in mammograms, prediction of strokes and heart attacks," notes Petia Radeva, professor at the Department of Mathematics and Computer Science of the UB. We could not be left

behind and therefore we have worked on this technology to help doctors fight COVID-19 by offering them high-precision data for the analysis of medical images in an objective, transparent and robust way," adds the expert, also head of the Consolidated Research Group Computer Vision and Machine Learning of the UB and principal researcher at the Computing Vision Centre.

"This type of automated system represents an important tool for health professionals in order to make more robust and accurate diagnoses, since it can provide information a human being could not measure," highlights Oliver Díaz, lecturer at the Department of Mathematics and Computer Science of the UB.

According to Vicent Ribas, head of the research line in Medicine Data Analytics at the EURECAT Digital Health Unit, "The accuracy of this tool, shown by the results of the study, opens the doors to its use for other health applications, a field in which the use of Artificial Intelligence is becoming more useful."

More information: Giuseppe Pezzano et al, CoLe-CNN+: Context learning - Convolutional neural network for COVID-19-Ground-Glass-Opacities detection and segmentation, *Computers in Biology and Medicine* (2021). DOI: 10.1016/j.compbiomed.2021.104689

Provided by University of Barcelona