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AI Can Detect COVID-19 in the Lungs Like a Virtual Physician, New Study Shows

The new UCF co-developed algorithm can accurately identify COVID-19 cases, as well as distinguish them from influenza.

BY ROBERT WELLS
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Researchers have demonstrated that an AI algorithm could be trained to classify COVID-19 pneumonia in computed tomography, or CT, scans with up to 90 percent accuracy. Photo credit: Adobe Stock

A University of Central Florida researcher is part of a new study showing that artificial intelligence can be nearly as accurate as a physician in diagnosing COVID-19 in the lungs.

The study, recently published in *Nature Communications*, shows the new technique can also overcome some of the challenges of current testing.

Researchers demonstrated that an AI algorithm could be trained to classify COVID-19 pneumonia in computed tomography (CT) scans with up to 90 percent accuracy, as well as correctly identify positive cases 84 percent of the time and negative cases 93 percent of the time.

CT scans offer a deeper insight into COVID-19 diagnosis and progression as compared to the often-used reverse transcription-polymerase chain reaction, or RT-PCR, tests. These tests have high false negative rates, delays in processing and other challenges.

Another benefit to CT scans is that they can detect COVID-19 in people without symptoms, in those who have early symptoms, during the height of the disease and after symptoms resolve.

However, CT is not always recommended as a diagnostic tool for COVID-19 because the disease often looks similar to influenza-associated pneumonias on the scans.

The new UCF co-developed algorithm can overcome this problem by accurately identifying COVID-19 cases, as well as distinguishing them from influenza, thus serving as a great potential aid for physicians, says Ulas Bagci, an assistant professor in UCF's Department of Computer Science.

Bagci was a co-author of the study and helped lead the research.

UCF computer science researcher Ulas Bagci is an expert in developing AI to assist physicians, including using it to

detect pancreatic and lung cancers in CT scans.

“We demonstrated that a deep learning-based AI approach can serve as a standardized and objective tool to assist healthcare systems as well as patients,” Bagci says. “It can be used as a complementary test tool in very specific limited populations, and it can be used rapidly and at large scale in the unfortunate event of a recurrent outbreak.”

Bagci is an expert in developing AI to assist physicians, including using it to detect pancreatic and lung cancers in CT scans.

He also has two large, National Institutes of Health grants exploring these topics, including $2.5 million for using deep learning to examine pancreatic cystic tumors and more than $2 million to study the use of artificial intelligence for lung cancer screening and diagnosis.

To perform the study, the researchers trained a computer algorithm to recognize COVID-19 in lung CT scans of 1,280 multinational patients from China, Japan and Italy.

Then they tested the algorithm on CT scans of 1,337 patients with lung diseases ranging from COVID-19 to cancer and non-COVID pneumonia.

When they compared the computer’s diagnoses with ones confirmed by physicians, they found that the algorithm was extremely proficient in accurately diagnosing COVID-19 pneumonia in the lungs and distinguishing it from other diseases, especially when examining CT scans in the early stages of disease progression.

“We showed that robust AI models can achieve up to 90 percent accuracy in independent test populations, maintain high specificity in non-COVID-19 related pneumonias, and demonstrate sufficient generalizability to unseen patient populations and centers,” Bagci says.

The UCF researcher is a longtime collaborator with study co-authors Baris Turkbey and Bradford J. Wood. Turkbey is an associate research physician at the NIH’s National Cancer Institute Molecular Imaging Branch, and Wood is the director of NIH’s Center for Interventional Oncology and chief of interventional radiology with NIH’s Clinical Center.

This research was supported with funds from the NIH Center for Interventional Oncology and the Intramural Research Program of the National Institutes of Health, intramural NIH grants, the NIH Intramural Targeted Anti-COVID-19 program, the National Cancer Institute and NIH.

Bagci received his doctorate in computer science from the University of Nottingham in England and joined UCF’s Department of Computer Science, part of the College of Engineering and Computer Science, in 2015. He is the Science Applications International Corp (SAIC) chair in UCF’s Department of Computer Science and a faculty member of UCF’s Center for Research in Computer Vision. SAIC is a Virginia-based government support and services company.

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