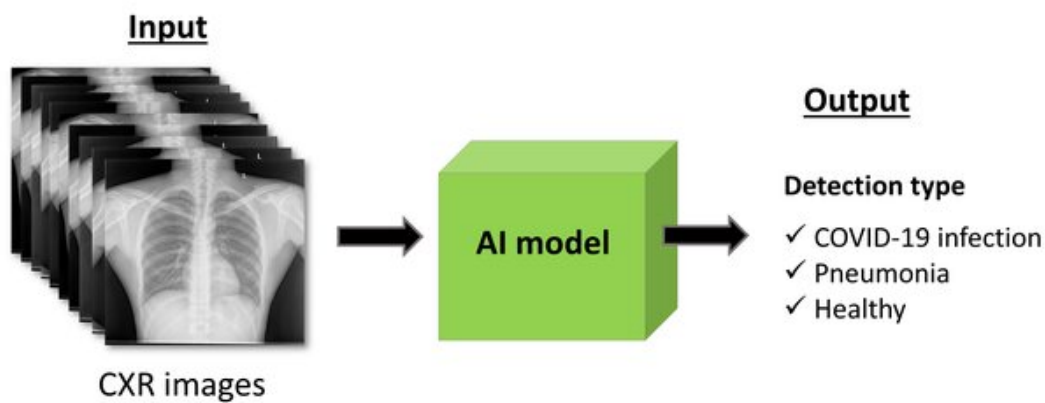


# Detecting COVID-19 by analyzing lung images using artificial intelligence models

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Researchers have designed artificial intelligence models using data from chest x-rays and CT scans of the lungs. This allows clinicians to detect and distinguish COVID-19 patients from pneumonia and healthy patients. Credit: Khademhosseini Laboratory

Medical imaging has long been a vital tool for the diagnosis and prognostic assessments of many diseases. In recent years, the use of artificial intelligence models has been used in conjunction with this

imaging to augment their diagnostic capabilities. By using these models, some features can be extracted from images that may reveal disease characteristics not identified by the naked eye. The power to process data in this intelligent manner can have a big impact on the medical field, especially with the current growth in imaging features and the need for high precision in medical decisions.

There is a huge demand for rapid and accurate detection of COVID-19 infection. The primary detection method has been using reverse transcription-polymerase chain reaction (RT-PCR) on samples collected from nasal or throat swabs. However, this method is subject to inaccuracies due to sampling errors, low viral load, and the method's sensitivity limitations. This is an especially significant issue for patients who are in the early stages of infection.

An additional diagnostic tool for COVID-19 can come from images of lungs. For diagnosing lung diseases, chest X-rays or CT scans are the primary resources, and they can be used to distinguish COVID-19 from other types of lung injuries, as well as to assess the severity of lung involvement in COVID-19. These types of images can enhance the diagnostic capabilities for COVID-19 patients, especially if they are coupled with artificial intelligence models.

Through a multi-institute collaborative effort, researchers from the Terasaki Institute for Biomedical Innovation (TIBI) have designed and validated an image-based detection of COVID-19 with the aid of artificial intelligence models. To accomplish this, they began by using a [model](#) to automatically collect imaging data from the lung lobes. This data was then analyzed to yield features as potential diagnostic biomarkers for COVID-19.

These diagnostic biomarkers using the artificial intelligence model were subsequently used to differentiate COVID-19 patients from both

pneumonia and healthy patients. The entire model was developed with a cohort of 704 chest X-rays and then independently validated with 1597 cases from multiple sources comprised of healthy, pneumonia, and COVID-19 patients. The results showed excellent performance by the model in classifying diagnoses of the various patients.

"This highly advanced artificial intelligence model further helps our ability to precisely detect COVID-19 patients. In addition, such a model can be applied for diagnosis of other diseases using different imaging modalities," said lead researcher Samad Ahadian, Ph.D.

The use of computer modeling with data extracted from medical images shows great promise in enabling precision medicine and can revolutionize medical practice in the clinic. Developing methodologies to capture entire sets of information while suppressing irrelevant features enhances the reliability of artificial intelligence models. The proposed approach would be a step towards applying them in precision medicine and can provide an efficient, inexpensive, and non-invasive way to strengthen the diagnostic capabilities of imaging.

"Artificial intelligence-driven models with diagnostic and predictive capabilities are a powerful tool that are an important part of our research platforms here at the institute," said Ali Khademhosseini, Ph.D., Director and CEO of TIBI. "This will carry over into countless applications in the biomedical field and in the clinic."

The study was published in the *Journal of Clinical Medicine*.

**More information:** Bardia Yousefi et al, Impartially Validated Multiple Deep-Chain Models to Detect COVID-19 in Chest X-ray Using Latent Space Radiomics, *Journal of Clinical Medicine* (2021). [DOI: 10.3390/jcm10143100](https://doi.org/10.3390/jcm10143100)

Provided by Terasaki Institute for Biomedical Innovation

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