Can AI Outperform Doctors at Detecting Lung Cancer?

In 2018, cancer was the second leading cause of death globally, accounting for about 9.6 million deaths – reports the World Health Organization (WHO).

In the same year, lung cancer ranked first in terms of both incidence and mortality among all types of cancer worldwide; accounting for 11.6% and 18.4% of all cancer cases and all cancer deaths, respectively. It presents poor general prognosis as the disease tends not to be diagnosed until it reaches a critical stage. For instance, the generally low five-year survival rate can be significantly lifted if it's diagnosed while in an earlier stage. A recent study also shows that 88% of 412 patients with stage I lung cancer lived up to 10 years after the diagnosis. This proves that early diagnosis of the disease is imperative to improve its prognosis and therapeutic decisions.

One of the effective approaches for reducing the mortality rate of lung cancer is screening as it helps medical experts to diagnose the disease before it presents any signs or related symptoms. Specifically, the National Lung Screening Trial (NLST) had demonstrated that there was a reduction of over 20% of the mortality rate in patients who underwent low-dose computed tomography (LDCT) screening. Lung screening enables accurate depiction of pulmonary nodules that indicate early development of lung cancer.

Error and discrepancy in radiology: inevitable or avoidable?

In CT images, pulmonary nodules are referred to as round or oval masses of lung tissues with a diameter of less than 30 millimeters. They vary in terms of size, location, density, and surroundings. Pulmonary nodules generally have a diameter large than 3 mm and those with a diameter of less than 3 mm are called micro-nodules. Non-nodules, including blood vessels and bronchi walls, present similar nodule-like appearances often causing false-positive during detection. In terms of density, pulmonary nodules can be classified as solid, ground glass, and partly solid nodules. In terms of location, the nodules may be isolated, juxta-vascular, or juxta-pleural. In short, the different kinds of pulmonary nodules substantially increase the challenges of achieving accurate detection and diagnosis.

Furthermore, the speedy development of CT screening of lung cancer has led to an exponential increase of images data to be examined by doctors, increasing their workload and resulting in erroneous diagnosis. This has resulted in unnecessary anxiety for patients and sometimes decreasing the chances of being cured. The error rate likely to occur in 20 CT images analysis conducted by a radiologist daily range from 7 – 15%. Therefore, with the goal of reducing the radiologists' workload and advancing early detection of lung cancer, countless methods for automatic medical images analysis have been proposed.

AI-powered lung nodule for faster pulmonary nodule detection

Deep-learning based algorithms are able to accurately analyze digital images of lung screenings and identify pre-cancerous changes that otherwise would have required further medical follow-up for proper diagnosis. The new automated visual evaluation has the potential to detect pulmonary nodules on chest CT scans while reducing the scan interpretation times.

Using millions of high-quality imaging scans, HaiLTH has deployed a deep learning engine that is capable of automatically detecting findings from imaging scans. Current capabilities include automatic detection of brain bleeds, sub-millimeter lung nodules, and cancer in brain tumors while new capabilities are being released. HaiLTH findings are integrated into the PACS system, enabling radiologists to include them in their reading and reporting workflow. Such automated assistance contributes to a more comprehensive and consistent reporting which improves the radiologists' output, contributing to overall improved patient care.

While additional work is required to further optimize the deep learning algorithm employing an automated evaluation of images of the lungs, the potential exists that it could favorably impact lung cancer-associated morbidity and mortality in clinical settings.