AI: Driving the future of diagnostics

Dr Pramod Dhembare, Founder and Managing Partner, Fidelity Diagnostics highlights the role of artificial intelligence in radiology sector

Joe had not been feeling well for the past few days. Because of his constant headaches and extreme fatigue, his doctor suggested some radiology tests. Though the reports looked normal, the early signs of a stroke were detected by the advanced Artificial Intelligence (AI) based engine used by the diagnostic center to assess radiology reports. Thanks to it, with early detection of abnormality and faster co-ordination with a specialist, Joe's treatment started early in the golden period, saving his life and preventing further complications like permanent disability.

AI in healthcare is not unknown. According to a market research report by Grandview research, "the global artificial intelligence in diagnostics market size was valued at USD 520.3 million in 2020 and is expected to expand at a compound annual growth rate (CAGR) of 32.8% from 2021 to 2028." It points out that the growing number of chronic diseases is one of the key factors behind the use of AI in healthcare fields, particularly diagnostics. This use is further strengthened due to the rising public health workforce shortage, leading to higher demand for technology-based solutions for better patient management and diagnosis.

Benefits of AI in radiology

AI-based systems can enable early and more accurate diagnoses in several ways. There has been exponential growth in machine learning, particularly deep learning, in automatically diagnosing diseases by learning to see patterns, like doctors see them.

Specifically, AI can help radiologists evaluate X-rays, CT scans, and MRI modalities for improved efficiency, faster turnaround time, better accuracy, and lesser chances of missing out on any positive finding like thrombosis, hemorrhage, or infarct while going through multiple images. An AI engine with good sensitivity and specificity can detect even minor abnormalities to help the radiologist community be faster and more accurate while reporting the cases to the treating physicians, surgeons, etc.

> The benefits of AI extend to imaging and radiology by removing cognitive bias and detecting signs that the human eye might miss. AI-based systems can thus offer a second opinion to physicians to prevent misdiagnosis or overdiagnosis

Additionally, the benefits of AI extend to imaging and radiology by removing cognitive bias and detecting signs that the human eye might miss. AI-based systems can thus offer a second opinion to physicians to prevent misdiagnosis or overdiagnosis.

The only drawback is the need to train the algorithm on vast datasets to get accurate results. Presently, fields of radiology and pathology already have digitized data that makes it easier to implement machine learning in areas such as:

- Detecting lung cancer, breast cancer, or strokes based on CT scans.
- Classifying skin lesions based on images.
- Assessing the risk of cardiac death or other diseases based on electrocardiograms and MRI images.
- Differentiate between different types of cancer to enhance precision medicine.

Early diagnoses can also improve clinical trial enrollment to speed innovations in the medical world.

Examples of AI-based products in radiology

'Qure.ai' is an Indian company that has created several products using AI in medical imaging. One of its products, qXR, detects abnormal chest X-rays and identifies and localizes 29 common abnormalities. It also screens for tuberculosis, making it a component of public health screening programs worldwide. In essence, qXR is a chest X-ray screening tool built with deep learning. It was trained over a million X-Ray and radiology reports to make it immune to X-ray quality and hardware-agnostic as well. Qure.ai claims to detect various brain abnormalities, including intracranial hemorrhages, cranial fractures, infarcts, midline shift, and mass effect (for tumor detection).

'Aidoc' also uses Deep Learning for radiology. Their solutions analyze medical imaging to flag acute abnormalities across the body, helping radiologists to come to more accurate conclusions and expedite patient care.

'Viz.ai', another tech-based healthcare firm, improves patient care through critical care coordination using AI. Viz.ai uses AI to synchronize stroke care, which reduces systemic delays that often reduce access to life-saving treatments. Viz claims to "coordinate care by connecting frontline HCPs to specialists earlier in the workflow enabling activation of care teams sooner, and streamlining the consultation process." Some powerful features include AI-powered disease detection and alerts and mobile image viewing for various medical reports.

Such tools help the radiologist detect abnormalities faster, prioritize these cases in the worklist, and quickly review and finalize the reports. In turn, this allows the treating physician to take quick action in cases like intracranial hemorrhage, large vessel occlusion, pulmonary embolism, intra-abdominal free gas, etc., which are potentially life-threatening if not treated early.

AI in pathology-An emerging field

A pathologist's report is usually the standard in the diagnosis of many diseases. However, reviewing pathology slides is quite a complex task. It requires years of training and expertise, and still, there can be substantial variance in the diagnoses given by different pathologists.

For instance, consensus between diagnoses can be as low as 48% in some forms of breast cancer as per original research published in Journal of American Medical Association. However, this lack of consensus isn't surprising given the massive amount of data and limited time.

To address these issues, some companies have introduced products that apply deep learning to digital pathology for the automated detection of anomalies. This will complement pathologists' workflow and improve accuracy by pro-

viding a trusted second opinion.

One example is 'Paige', a NY City-based start-up with an exclusive license with Memorial Sloan Kettering Cancer Center (MSKCC) to access its pathology department's 25 million slides. It is reported that MSKCC is digitizing over 1000 slides per day. Paige uses machine-learning algorithms with Convolutional Neural Networks to deliver AI-based digital diagnostics to drive diagnostic confidence and a more productive pathology workflow.

'PathAI' is another such technology start up prioritizing the improvement of patient outcomes by integrating AI-powered technology in pathology workflows to provide patients with more accurate diagnoses and efficient treatments.

Barriers to adoption

While AI cannot replace doctors, it can surely improve their efficiency. However, this technology isn't widely accepted in the field due to various barriers, such as:

- The requirement of large and diverse datasets to train AI.
- Ethics in data collection pose a potential issue. Patient data must be protected, and full disclosure to patients is necessary if their data will be fed in an AI algorithm.
- The safety of the system to prevent security breaches and theft of patient data.
- Reluctance to integrating new technology and the cost of integration with legacy systems.

Regulatory clearance is another factor that is vital to the adoption of AI in radiology and pathology. If the companies developing these AI-based products get regulatory clearance, either from USFDA for marketing in the US or CE marking for marketing in Europe, the acceptability of these products would be better amongst the radiologists and pathologists, as well as large treatment centers. These regulatory authorities have stringent criteria for evaluating the sensitivity and specificity of these AI engines before granting approval.

The bottom line

AI isn't fully trained to work on its own and can only be used in a supportive rule to 'augment the intelligence' of doctors by giving them a second opinion based on scientific data.

Besides training the algorithms, the focus should be on promoting a hybrid model wherein highly trained humans work with AI to achieve medical accuracy and save lives. We should know the risks that come with technology and mitigate them. Overall, ethical use of data and transparent systems will promote faster adoption of AI in healthcare.