

# Role of Artificial Intelligence in Healthcare Services

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## ABSTRACT

Artificial Intelligence (AI), is one of the important tools widely used by radio-diagnostic and pathology images purposes. In the recent years AI play very important role in automated image analysis, aiding diagnoses, and improving clinical workflow. In recent years AI play interesting role in the field of cancer diagnostic. However there are so many challenges regarding the results and data biasness and legal accountability and ethical concerns. AI generated results and their data validation process is one of the big challenges in this field. In this article we cover the significant role of AI on medical diagnostic and their pros and cons of its use and the future of AI in radiology field.

**KEYWORDS:** Artificial Intelligence, Radiology, Diagnostics, Ethics.

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## INTRODUCTION

AI is one of the widely used tools in many areas of medicine, and pathology for the diagnosis and imaging purposes, for the detection and diagnosis of various disease. Ideas about using artificial intelligence (AI) in imaging started to come up in the 1960s, but early attempts were limited by the technology of the time. The use of AI in radiology scanning and imaging became much more common in the 1980s because that time artificial neural networks and AI-based computer-aided detection (CAD) tools already available.<sup>1,2</sup>

Using microprocessor-based decision-making systems is a big change, like the wheel or the use of fire. We are on the verge of a technological revolution. Artificial neural network systems can now make decisions about the meaning and results of human-related data, which was something that only humans could do before. This has changed the way we process and evaluate data in a big way.<sup>3</sup>

One reason AI is so widely used in healthcare is that it can solve hard problems in new ways, which is great for jobs that have to be done over and over again and take a lot of time. AI is already making a difference in fields like genetics, materials biology, and biochemistry by analyzing multidimensional data. This is leading to the creation of new structures and molecules that could be used as medicines or biomaterials.<sup>4</sup> AI-powered decision systems are perfect for these jobs because pattern recognition is repetitive and diagnostic imaging takes a long time because doctors have to find and sort patterns. The fact that there are so many algorithms that can find problems in medical images shows that this is an important area of research for scientists. These algorithms are based on convolutional neural network architectures that have been trained on certain image patterns.<sup>1,4,5</sup>

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As the world's population grows, the workload of radiologists is getting heavier. Using AI to find diseases is becoming more popular as a possible way to help with this. This diagnostic method could make radiologist work easier and reduce differences in practice because radiologists have different levels of skill at finding and understanding picture features.<sup>5,6</sup> Recent studies show that radiology could benefit from artificial intelligence in many areas, such as interpreting images, finding important information, improving image quality, setting priorities, making treatment recommendations and building automated protocols.<sup>7,8</sup> In this review article briefly described the area about using AI in medical practise and challenges and limitations in this field.

## What is artificial intelligence?

Artificial Intelligence (AI) is the field of science and engineering that works to build smart computers that can learn and solve problems like people do by using algorithms or a set of rules. AI can predict situations or problems and solve them in a professional manner, and flexible way. The best thing about AI is that it can learn and find patterns and connections in huge, multidimensional, and multimodal datasets. AI is not one technology that works for everyone. Instead, it includes various subfields, such as basically combination of machine as well as deep learning, that improve the intelligence of applications on their own or together.



**Figure 1:** Evolution of AI

AI used various system for analysing images and report generation and further their interpretation. CNNs remain dominant in imaging and slide analysis due to their pattern-recognition performance. GPU acceleration enables real-time inference. Transformer-based systems and multimodal LLMs are emerging for both image understanding and report generation. Prominent products include Aidoc's stroke and PE triage tools and Quibim's radiomics platforms for brain and liver diseases.<sup>9,10</sup>

### Differences between AI-powered and manual referral and diagnosis

A study that looks at how three large stroke centers in the UK are using the latest AI apps to help stroke patients. They kept track of the "door-to-treatment" phase of the stroke pathway, which went from the patient's scan to the decision to treat. One research shows that AI could change a lot about how doctors diagnose strokes and suggest therapy for patients.<sup>1,5</sup> Traditionally, the first steps in the diagnostic process were to look at the patient, gather relevant information, and make an intuitive diagnosis. The process of getting, combining, and understanding information over and over again is used to slowly improve the initial judgment. A diagnostic judgment, which gives a category label to help with therapy (such as thrombolysis or thrombectomy), usually ends this process of refining, which includes making hypotheses, fine-tuning them, and checking them. Experts say that AI is not currently designed to help with the diagnosis process, though. The main goal of predictive AI technologies is usually to give a clear yes or no answer to the question of whether a patient has a certain diagnosis. This answer is usually given as a label for a diagnosis. Some people say that this method is pointless unless it also tells you how to get to the right place. A new method is being worked on that starts with an AI suggestion and then checks its accuracy against several verification procedures instead of just taking the AI's diagnostic output or "label." This includes checking against existing medical standards, talking to other experts, and comparing patient information.

Doctors can keep doing their important work and use AI to make better diagnoses by getting used to this new way of working. All of this is done while still keeping clinical rigor and supervision in place. In the advanced stroke AI adoption settings we looked at, the diagnosis process starts with AI making a suggestion (diagnostic label) based on how it processes MRI and CT images. AI "diagnosis," at least in the limited sense of algorithmic output, is more often available early on instead of being saved for the very end of the diagnostic process.<sup>5,11,12</sup>

### Application in the radiology imaging

AI play very critical role in radiological imaging model system. Getting photos and putting them back together in the appropriate sequence. AI makes it easier to put photos together, which implies that CT scans can be better and use less radiation, and MRI scans can be done more quickly. The FDA has approved the use of 758 AI algorithms in X-rays. These are around 76% of all clinical AI technologies in the US. These algorithms can discover a lot of brain-related disorders, like strokes, brain tumors, breast cancer, lung nodules, and more. A study of 80,000 women's mammograms indicated that an AI and two radiologists working together could discover 20% more malignancies than just two radiologists working alone. Most radiologists think that generative artificial intelligence, especially LLM-based systems, makes their jobs a lot simpler by taking away their routine works like chatting to patients and drafting reports.<sup>13-15</sup>

### Application in pathology diagnostic

The Food and Drug Administration (FDA) approved digital pathology and whole-slide imaging (WSI) instruments like the Roche VENTANA DP 200 digital scanner in 2024 to help doctors make their first diagnosis. These technologies employ AI to look at presentations in a way that helps doctors do their jobs. Pathologists who utilized AI to assess Gleason in prostate samples noticed a considerable improvement in how well they agreed with each other. Cohen's  $\kappa$  rose from 0.799 to 0.872, which made it 4.2 times easier to discover and grade cancer.<sup>16,17</sup> Deep learning systems have been able to attain accuracy rates of 63 to 100 percent for different kinds of cancer. This shows how strong and adaptable these systems could be. A meta-analysis of 48 studies that used roughly 152,000 WSIs indicated that the average diagnostic sensitivity was 96.3% and the average specificity was 93.3%. There was a lot of bias and a lot of variances in the study designs, but this still happened.<sup>1,18</sup>

### Studying biomarkers with Omics and other biomarkers at the same time

AI help Pathologists to look at immunohistochemistry markers like Ki-67 and PD-L1 and combine imaging and multi-omics data to figure out what kind of cancer a patient has. For instance, AI systems also help them to diagnosed issues with both the liver and gallbladder at the same time

employ genetic information and MRI scans of the iron and fat content of tissue and scan whole apart in a same time and save time and keep away patients multiple visit to pathology.<sup>15,19</sup>

### Issues and limits for the uses of AI

We can't know how effectively AI algorithms operate in the actual world because they were mostly trained on data from groups of people who weren't typical. As has been established, a lot of studies don't have enough information regarding how different groups of individuals accomplish things. It's becoming difficult to secure clinical approval for AI systems that work in a black box. Explainable artificial intelligence (XAI) is a new idea, but it's incredibly significant. There are a lot of privacy problems with histopathology image data. Simply removing identifying information may not be enough to keep picture matching from leading to the person's identification again. There need to be guidelines and ways to keep the names of the persons engaged secret in order to undertake research in an ethical way. Workflows that leverage AI are the greatest approach to get things done. People and machines work together in these processes to produce better results than either could get alone. It is still very vital to watch clinical supervision and complete very extensive examinations in the actual world.<sup>20,21</sup>

### CONCLUSION

Artificial intelligence is improving the fields of radiology and pathology by making diagnosis more accurate and speeding up labour processes. Pathology is getting more popular because of powerful digital platforms, but radiology is still ahead because it has hundreds of FDA-approved technologies. There are a lot of issues, such having to pay for infrastructure, having data that isn't fair, and not being able to interpret it well. Be honest, work with individuals who care about the outcome, and do the right thing. Federated training, explainable models, generative reporting, and integrated clinician-AI workflows are all on the way, but people will still be highly crucial in all of these areas of development.

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