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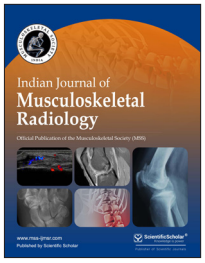

Editorial

Artificial intelligence in musculoskeletal radiology

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Received: 05 June 2022
Accepted: 05 June 2022
EPub Ahead of Print: 16 June 2022
Published: 23 June 2022

DOI
10.25259/IJMSR_14_2022

Quick Response Code:

Artificial intelligence (AI) in radiology has been establishing its mark. We are witnessing gradual inroads of AI in almost all branches of medicine, and radiology subspecialties are not immune to this change. AI will have a significant impact on various aspects of musculoskeletal (MSK) radiology. How we interact with AI as MSK radiologists will determine the direction of the field and its impact on our practice. With the advent of automation in radiology practices, AI will certainly continue to augment radiological techniques in the future. It will eliminate the monotonous and time-consuming activities, making radiology more impactful and ensuring comprehensive, detailed reports and analysis. MSK radiology was at the forefront when the Radiological Society of North America kick-started the creation of AI tools in 2017 by organizing a challenge to assess bone age from pediatric hand radiographs (Alexander Bilbily, MD, BHSc, FRCPC; Mark Cicero, MD, BESC, FRCPC stood first in the challenge). One interesting finding was that combining AI and human experts produced substantially superior results while saving time and effort.

There are several related areas where the potential of AI is being utilized for interesting work, such as fracture detection (Imagen Inc.), joint space narrowing detection for knee joints (DeepTek Inc.), and MRI spine quantification (CoLumbo). However, this is only the beginning and there is still more work to be done. AI is an evolving space, and radiologists must be informed of the new advances and comprehend their implications. For this, the conversation around AI must begin at the academic level and be incorporated into the radiology curriculum. To ensure that this information is supplemented by practical knowledge, institutions should lead the way by sharing annotated labeled datasets to foster innovation and research for specific pathology and modality. This can also enable innovators and data scientists to collaborate with institutions to develop solutions in the laboratory. These can be good playgrounds to obtain hands-on experience with AI, and institutes should have incubation centers/research laboratories to promote this culture.

Transferring AI from the laboratory to the radiology workflow is a challenging task with many failures since radiology workflows can be quite complex. The real-world value of AI must be shown by demonstrating its utility against a larger dataset to ensure that the AI model is robust and generalizable. This is a big challenge in MSK radiology for radiographic imaging as well as MRI studies. Although deep learning algorithms have been the primary drivers of AI, numerous other factors influence radiology workflows. At present, AI is focused on narrow problem-solving and may identify or quantify specific regions, which is a typical radiology workflow that may not be a game-changer as there are a plethora of findings, some subtle and some obvious, that must find their way into radiology reports.

Running AI inference on multiple pathologies can be time-consuming and costly, and the outcomes may not necessarily be as expected. As a result, the AI journey for hospitals, imaging

clinics, and radiologists will be lengthy, with each investment in AI will need to justify the value add in terms of productivity, quality, report turnaround time, and such justification will drive the incorporation of AI in radiology practices including MSK imaging. Second, for AI to be incorporated into routine radiological examinations, AI-based technologies should be able to instill trust in radiologists, health care workers, hospital administrators, and patients. By developing trust, AI can boost the value that MSK imaging experts can deliver to their patients and referring clinicians by improving image quality, reader efficiency, patient centricity, and diagnostic accuracy.

In the near future as we explore high-speed quantum computing, contemplate innovations in the process of deep learning-based data annotations, and evolutionary changes in convolutional neural networks, the bouquet of deep learning/machine learning algorithms is anticipated to expand. It is expected to be integrated into smart reporting, making a preliminary report available for use by imaging experts. The AI tools will continue to be the augmenters of radiology practice and will play a significant role as virtual radiology assistants. As MSK radiologists, we will have to pick and choose these tools to make our armamentarium smarter and stronger.

How to cite this article: Kharat A, Negi RS. Artificial intelligence in musculoskeletal radiology. Indian J Musculoskelet Radiol 2022;4:1-2.