

Chapter 12

Artificial Intelligence in Medical Imaging

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ABSTRACT

Integrating Artificial Intelligence (AI) in medical imagery is being considered as a game changer in radiology as compared to any other medical fields. Radiologists are at the forefront of innovations and technological advancements in medical image analysis. They are still not able to adapt the fast-changing technological advancement brought by AI in their profession. They are still reluctant to leave their traditional clinical practices and to progress towards AI techniques such as Neural Networks (NN) and Deep Learning (DL). In this chapter, we will be discussing about the current role of AI in medical imaging i.e. Radiology. Is it a threat or an opportunity for radiologists? Will AI completely replace radiologists entirely? Furthermore, the future challenges and risks that needs to be addressed by healthcare community before the deployment of AI for use by radiologists for their clinical practices. This chapter will help the readers to understand how the medical community especially radiologists are adapting AI based solutions to get a deeper understanding of medical images.

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INTRODUCTION

Artificial Intelligence systems are progressively being used in healthcare services as major decision support systems in clinical practices and have shown remarkable performance in the field of medical imaging (Hadjiiski et al., 2023), (Rajpurkar & Lungren, 2023), (Najjar, 2023). Deep learning, a branch of artificial intelligence that makes use of Convolutional Neural Networks (CNNs), has demonstrated exceptional efficacy in diagnosing clinical conditions, enhancing clinician's workflow efficiency, and handling other administrative duties (Huisman et al., 2021). While AI has shown great potential in assisting with image analysis and interpretation, there are still several concerns and limitations that make its use questionable for radiologists. An international survey (Huisman et al., 2021) was conducted in 2019 on AI in radiology with 1,041(65% male and 35% female) radiologists and radiology residents having ages ranging from (24-74), to understand the different perceptions of radiologists in adopting AI into their daily clinical practices. Various radiological societies, social media and multiple author networks were involved for the conduction of this survey. The survey concluded that radiologists and residents with basic/low levels of AI-specific awareness in radiology (38%) are having less favorable attitude towards adoption of AI in their job practices along with fear of being replaced by AI in near future. Those who possess moderate to expert level AI-specific knowledge and awareness in radiology (48%) are quite optimistic and showing proactive mindset towards adopting AI in radiology. Clinical use of AI can be facilitated by providing training to radiologists as a part of their curriculum.

This chapter will unfold the intricate acceptance journey of AI in radiology, which is driving revolutionary changes in healthcare landscape beginning from discovery of X-rays to now inculcating ML and DL in computer aided medical image analysis. The main objective of this book chapter is to shed some light on the current role of AI in radiology, Is it really a matter of concern for radiologists being replaced by AI entirely or a great opportunity for radiologists to increase their work flow efficiency, better predictive analysis and better decision making through computer aided diagnosis? Furthermore, the future challenges and risks that needs to be addressed by clinicians before the adoption of AI by radiologists for their clinical practices and decision making processes. This chapter will assist readers in comprehending how the medical field, particularly radiologists, is utilizing AI-based solutions to gain a better understanding of medical images in order to support their clinical and/or medical decision-making. Furthermore, we will be providing an overview of the newest buzzword in medical image analysis, Explainable Artificial Intelligence (XAI), in order to develop more reliable and understandable AI-based solutions for medical images that physicians can use in their daily practices and offer patients reliable automated clinical treatment.

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