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Clin Rad Artificial Intelligence Special Issue

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1. Editorial

Artificial Intelligence (AI) in radiology has seen a rapid expansion of its literature in recent years. Between 2000 and 2018, there has been a global exponential growth of AI research-related publications in radiology. [1] Ranked by the total number of citations, the top 100 articles have been identified; with the United States being the most common country of origin (42%), followed by the Netherlands (11%) and China (9%). The top three subject areas covered by these papers were neuroimaging, oncology and respiratory [2].

Beyond research, AI has been rapidly gaining recognition for its utility in day-to-day radiological practice. As with any medical innovation, governmental approval is the first step to clinical use. In the United States, the Food and Drug Administration (FDA) has proposed specific regulations for governing the approval of AI software as medical devices. [3, 4] To date, there are 42 FDA-approved devices pertaining to chest radiology, on a range of radiological applications including lung nodules detection and evaluation, lines/tubes positioning, emergent setting findings, and parenchymal abnormality assessments. In Europe, the equivalent is CE-marked status, and there are 62 such products as of 2022. [5, 6] In both markets, more than half of the approved products have gained their approval in the last 3 years, marking the rapid development and commercialisation of the field in recent years.

The COVID-19 pandemic has presented some unprecedented challenges as well as opportunities to the AI research community. As part of the global effort to tackle the crisis, researchers have focused their works on various aspects of the disease, including its diagnosis on chest radiographs and CT, and the detection of long-term sequelae on imaging. To this end, numerous deep learning algorithms have been published by various centres around the world, with some implementing state-of-the-art architectural designs and reporting notable performances [7, 8]. A particularly remarkable trend is the speed at which researchers have conducted and disseminated their works internationally, helped in part by favourable ethics, funding, and publication policies, and demonstrates the potential to accelerate the pace of AI research in radiology. As the world gradually emerges out of the pandemic, the knowledge and experience gained through undertaking these tasks would continue to benefit researchers in related applications.

Radiomics is a very active area of research in radiology, covering areas including oncological imaging as well as non-oncological applications. This technique can seem straightforward on the surface, trying to understand the patterns with the image voxels. However, understanding the meanings of the terminology and the methodologies used in the development of radiomic signatures is quite complex for those not working directly in the field. provide a comprehensive guide to radiomics and cover a wide range of potential applications of radiomic methods (ref). The potential benefits of gaining additional information from the images already obtained for diagnostic purposes is very appealing. In addition, the integration of clinical and genetic information with radiomic signatures is an exciting area. Nonetheless, the challenges are real, with differences in acquisition protocols across all modalities and differences in methodologies for developing radiomic predictors. These techniques clearly require detailed work, including wider external validation, to translate safely into clinical use with the hope of translation only being possible through the hard work of researchers performing well-designed studies (reference the previous editorial Hype/hope/hard work). have reviewed the current status of radiogenomics within the field of glioma imaging (ref). Approaches to translating the research to allow radiomics to become a clinical tool in precision cancer medicine are discussed. In the coming years, radiologists will need to become important partners in testing the diagnostic accuracy of such tools and their role in outcome prediction and prognosis. [this would be a good place to add in about well-designed trials using appropriate reporting guidelines – DECIDE Ai and also the need for the registry to ensure safe usage in clinical practice.

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