

SHORT ABSTRACT

Artificial Intelligence in Radiology: Hype or Hope?

Erik Ranschaert

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Radiology is a specialty that is closely related to technology and therefore constantly subject to change. The “next big thing” in radiology is not a new type of scanner or storage device or image delivery system, but technologies to improve or accelerate image data interpretation or to facilitate tasks with less or no input from a radiologist: this is what most people refer to as “artificial intelligence” (AI) in radiology [1]. The recent hype about AI in radiology is mainly due to the success of the tools based on Deep Learning (DL) for analysing medical images. In less than a decade, computers and algorithms based upon DL have gained the power to equal or exceed humans in an increasing number of simple tasks, such as the detection of pneumonia on a chest X-ray or the analysis of white matter lesions on MRI scans of the brain [2]. There is both a lot of excitement and a lot of uneasiness about the disruptive potential of DL and artificial AI. Numerous news reports would appear to announce an imminent takeover of the profession by computers armed with DL-based software. Some algorithms are able to do certain tasks better than the average radiologist. Due to these recent events, statements and publications, radiology trainees find themselves in a vulnerable position, and some may have doubts regarding whether they should have pursued diagnostic radiology as a career if they had known of the potential impact artificial intelligence is predicted to have on the specialty [3]. Is the future for radiology in danger? Are the real risks for radiologists as bad as predicted in these media? Should residents or young doctors be afraid of choosing a career in radiology? In this presentation we will try to provide an answer to those questions, as well as suggestions on how to deal with these exciting changes.

With medical imaging being one of the fastest-moving areas with technological changes in health care, the expectations for radiology are very high and have escalated into real hype.

A crucial question that concerns many radiologists on a global level is what expectation level is realistic and on what terms – i.e., how severe will the impact of the new technology be on the radiological profession, and on what terms? The Gartner hype cycle is a well-known representation of the evolution of expectations for new

technologies (**Figure 1**). When the level of expectation is set too high, disappointment will inevitably follow, even if the fundamental technology is sound. When setting a level of expectation, it is essential to make a distinction between applications that will complement radiologists in fulfilling repetitive, time-consuming narrow tasks, such as lung nodule detection, and those that will become supplementary and perform functions that radiologists cannot perform themselves, such as making a treatment proposal or survival prognosis of the patient by integrating the imaging findings with all other data available in the EHR. Predicting the time frames applicable to the development of AI applications that will surpass radiologists is very difficult and depends on many factors. From this presentation it should become clear that there are still many hurdles to be taken, which are not only located in the development of software, but also in the creation of the appropriate infrastructure for exchanging patient data and acceptance of global standards for the development and validation of algorithms.

There are still many known and unknown risks or traps connected to the use of DL-based solutions, and this issue will also be addressed. Although the currently existing weaknesses and problems with early implementations of algorithms for radiology will progressively become more visible, they potentially could remain hidden for many future users because of their lack of basic knowledge in this technique. A basic knowledge of computer science, statistics and deep learning should therefore be regarded as a prerequisite to understanding and foreseeing what can go wrong and how it can be avoided or improved [4].

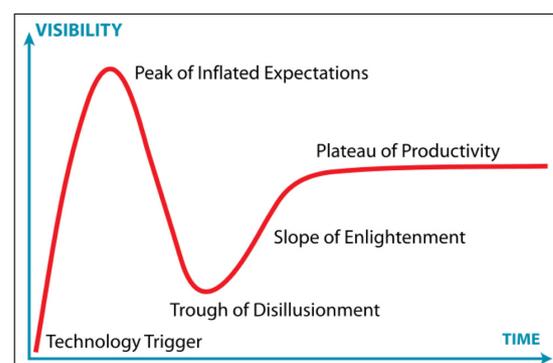


Figure 1: The Gartner hype cycle representing the evolution of expectations for new technologies.

In essence, this can be compared with the basic medical physics knowledge that every radiologist working with MRI machines and interpreting MRI studies needs. As the physical principals of MRI are integrated in every radiologist's training, the basic principles of DL should also be part of every state-of-the-art training curriculum.

Other important issues connected to usage and integration of DL-based software applications in a clinical and radiological environment, such as the quality and readiness of data, and the legal and ethical issues, will also be addressed in this lecture.

Competing Interests

The author has no competing interests to declare.

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