Journal of Kathmandu Medical College, Vol. 11, No. 4, Issue 42, Oct.-Dec., 2022

Artificial intelligence and radiology – Where are we headed?

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Within a span of a few decades, science has evolved from completing the first programmable, electronic, general-purpose digital computer, Electronic Numerical Integrator and Computer (ENIAC) in 1945 to making machines work with high precision to automate a huge number of tasks.[1] As artificial intelligence (AI) continues to grow exponentially day-after-day worldwide, humans today pursue improvements to make machines perform at a near-human level.

The coronavirus disease 2019 (COVID-19) pandemic exponentially fuelled and fastened the process, changing lives and the ways in which we do a lot of things across all sectors including classrooms.[2] Recent transition from traditional to virtual learning has seen wide implications with AI-augmented teaching programs showing higher post-learning accuracy in AI-assisted learning group compared to a conventional learning group.[3] As the world tried to find ways to go on, a virtual tele simulation curriculum was developed at various institutions such as, the Yale School of Medicine, comprising of simulated clinical scenarios to further enhance learning for medical students online.[4]

Access this article online

Website: www.jkmc.com.np

DOI: https://doi.org/10.3126/jkmc.v11i4.50792

HOW TO CITE
Rajak A, Thapa NB. Artificial intelligence and radiology – Where are we headed? J Kathmandu Med Coll. 2022;11(4):195-6.

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ISSN: 2019-1785 (Print), 2091-1793 (Online)

Artificial intelligence is here to entirely revolutionise medicine and patient care, touching lives in all possible ways; some fields and speciality being affected more than others. For instance, it is expected that the application of AI in radiology is going to be more advanced compared to others, in part also giving radiologists the lead-role in AI technology and tool development.[5]

In radiology, AI will increase accuracy of diagnosis and help distinguish cases that require prompt or early review – saving valuable time for treatment or intervention; spotting typical findings on imaging which are vital to diagnose diseases that could otherwise be missed.[6] Furthermore, AI in context to image reconstruction and image quality control are already in place, these being the first steps, as a whole lot of development awaits.[5]

Everyone share different opinions as to how AI is going to change the world, including rumours that a large number of people and specially radiologists might just lose jobs. However, majority believe that AI is going to be a boon to the modern world with humans on the driving seat, helping higher levels of automation to regulate and prioritise work eventually aiding health workers to find balance in their lives to a greater extent, all coming together to modernise effective patient care with better outcome.

"Burnout refers to a constellation of symptoms, including a loss of enthusiasm for work, a high degree of emotional exhaustion, high degree of depersonalisation, and a low sense of personal accomplishment".[7] All physicians across all specialties are reported to be at high risk of suffering from burnout in comparison to other professionals in other sectors, which is expected to further rise.[7] With AI looking very promising, it is expected that it will help prevent burnouts among radiologists, who experience the highest rates of burnout, helping them and other physicians as well, maintain a work-life balance.[7]

Everyday massive volume of digital data are produced in today's age of "big data". Different sectors worldwide have incorporated AI into their workflow to better deal with it. To a larger extent "big data" are also considered to

be the substrate for AI research.[6] The world can definitely expect more sophisticated AI software to support all that. The AI applications continue to grow exponentially with the use of enhanced deep learning algorithms. They further add to the existing computing enhancements with ever growing computing systems making big data interpretation and analysis possible.[6]

The design architecture is undergoing a revolution to enhance user experience both for health professionals and patients, leading to a whole new level of AI approaches coming in, to find new AI solutions.[8] The world has learnt and gained a lot from deep learning. The possibilities are infinite, and its potential in medicine is likely to change quite a number of things in how things operate at present.

With how fascinating the evolution of AI is going to be, we can also expect a number of challenges headed our way. The AI will eventually grow in all sectors, with the present technical issues disappearing over time. In the nearest future, hurdles in implementation, possession, regulation, authorisation, protection of data and privacy, and accountability are expected to arise.[9]

While AI can be criticised for its lack of emotional intelligence, empathy and adaptation skills which are considered vital for patient care, many including me choose to think otherwise – AI is here to assist and not to replace how we as doctors' function in the health care industry where human interaction will always be significant.

While there is much that await with AI being incorporated at multiple levels, the question stands if Nepal is ready. With a lot of changes still lagging, it is time for us, health professionals, to be really serious and think of various ways AI can be adapted in context to Nepal.

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