

Editorial

Artificial intelligence in healthcare in Nepal

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Artificial intelligence (AI) uses a computer to model intelligent behaviour with minimal intervention from humans [1]. AI can replicate the intellectual processes of a human being [2]. Other related terms are machine learning and deep learning. AI is based to a large extent. AI is increasingly being used in different fields of human activity and is a vital component of the fourth industrial revolution on human brain architecture. There is a non-linear relationship between input and output using algorithms. In machine learning a system can learn from previously available data and the learning becomes stronger as more data is provided [3]. Deep learning is a subset of machine learning structured like a human brain and can interpret multiple datasets simultaneously and analyse and interpret the data at different levels until an output is produced [4]. Deep learning uses convoluted neural networks (CNN) which are layers of algorithms linked to each other to provide the results. In medicine and healthcare, AI is being used in a variety of settings and the use is constantly increasing. Healthcare AI applications are receiving massive investment. Pre-Covid, AI was being used to schedule appointments online, send reminder

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calls and notifications, digitize medical records, facilitate online check in at medical centres, and carry out dose calculations and to warn about adverse drug reactions [5]. The Netherlands uses AI to analyse their healthcare system to reduce errors and improve efficiency. AI can free physician time to focus on patient care and improve efficiency, productivity, and precision of care. Primary care physicians can be supported to identify patients requiring extra care and to personalize care protocols for individual patients. AI systems can learn quickly from successive cases and can be exposed to many cases within a short time.

Electronic health records (EHR) are vital for using AI in healthcare and a recent article examines the sharing of and confidentiality of personal healthcare data [6]. Data has become an important resource in the 21st century and patients should have confidence that both the government and the commercial sector will treat their data with due care and attention. Obtaining informed consent from patients and possibly, sharing the gains from monetizing healthcare data is important. Even in developed nations healthcare data is segregated and organizations still lack the infrastructure to collect high quality data. In

Nepal, EHR is still uncommon though certain organization have begun using it. The algorithms and processes behind AI should be localized to fit local populations and practice patterns and must be rigorously tested for bias across different patient cohorts [7]. Nepal is a country with tremendous ethnic, linguistic, and genetic diversity within a small area highlighting the importance of this process. This process should continue even after the applications are introduced into practice.

Among other uses AI is being used to diagnose and grade breast cancer, cervical cancer, and glioma and in endoscopy and colonoscopy to detect lesions in the gastrointestinal tract [3]. AI has been used as a triaging tool and AI-based triage should reduce the burden on the healthcare system and direct resources toward patients who require it the most [8]. A variety of other uses have been described in both the scientific and the lay literature.

The accuracy of an algorithm in performing a task or reaching a diagnosis is of paramount importance and the process the algorithm follows to reach a diagnosis should be transparent and humans should be able to understand and interpret how the technology arrived at the decision. The issue of patient safety has also received attention. AI technology learns based on historic data and during the periods of learning system performance will be unpredictable and human-machine interactions can also affect performance. The other major problem is of accountability. Who should be held responsible if an AI system makes an error?

The healthcare workforce will play an important role in 'educating' the new AI technologies and in their proper use. They should be fully aware of the strengths and limitations of AI. Curricula both at the undergraduate and postgraduate level should

include health informatics, computer science and statistics [9]. Regulatory systems to govern the use of AI is also important. The use of EHR and wearable devices will generate an enormous amount of data (an example of big data) that should be analysed and interpreted to provide lifestyle advice, and recommendations about preventive and therapeutic measures [1].

AI can provide low-cost solutions to health problems, and this can be especially important for a lower-middle-income country like Nepal. Mobile phones and smart phones which have become ubiquitous will play an important role and Ubenwa, a mobile phone app examines the cries of new-born babies to identify birth asphyxia [10]. A screening device for diabetic eye disease has also been developed. Dermatological conditions are also being diagnosed using AI. SPIRIT-AI has been proposed as a framework to evaluate the AI intervention, the context of its implementation, data management issues, interactions between humans and AI and error case analysis.

The COVID-19 pandemic has underlined the importance of AI in health. Most contact tracing apps utilize AI and AI guided chat-box have been used to communicate with and provide information to the public [11]. AI has been used to predict the burden of COVID cases in a region or country and to measure the effectiveness of various control measures. It has also played an important role in developing new medicines and repurposing existing medicines against COVID. AI can also improve the accuracy of diagnostic methods for the infection.

In Nepal, recently a healthcare information technology company has developed a system to provide services to patients, hospitals, and doctors [12]. A recent article emphasizes the

need for laws and regulatory mechanisms in Nepal to regulate AI, reduce its malicious use and address infringement of intellectual property rights [13]. Nepal should develop mechanisms to keep track of and utilize global developments in AI. A major task would be to digitize health records and introduce EHR so that AI systems can access high quality, anonymised and de-identified data. The issue of data safety and confidentiality and empowering patients to make informed decisions about their health data is vital. The country should start utilizing the IT sector to develop local solutions.

The healthcare force should be educated regarding AI. Even in developed nations there are few plans regarding incorporating AI in the medical curriculum [14]. A study in the United States recommends medical schools work together to create a curriculum to equip students with AI knowledge and skills. The medical curriculum is overloaded and must accommodate a variety of disciplines and demands. Hence it has been recommended to accommodate data science and AI within the existing curriculum and provide examples from medical practice [15]. Additional training can be provided as per the needs and interests of students. Training in AI will be interdisciplinary and one of the challenges will be bringing together faculty from different disciplines.

A recent article examines the pros and cons of AI in healthcare [16]. Among the pros are AI provides real time data, streamlines tasks, saves time and resources, helps with research, and can reduce physician stress. Among the cons are it may need human oversight, may not consider social variables, may lead to unemployment, is susceptible to security risks and inaccuracies are possible. AI will change the nature and type of jobs and jobs requiring

greater knowledge, skill and creativity are more likely to be created. AI has the potential to reduce the various healthcare challenges in Nepal. The healthcare education system in the country must take up the challenge in creating healthcare professionals who can help in the development and can work together with AI to optimize the quality of provided healthcare.

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