Editorial

AI Revolution in Medical Diagnostics: Empowering Early Detection and Precision Healthcare

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Cite this Editorial: Ibrahim M. AI Revolution in Medical Diagnostics: Empowering Early Detection and Precision Healthcare. Student Supplement of Journal of Rawalpindi Medical College (SJRMC). 2023;27(1):1-2.

Online Access

Recent developments in artificial intelligence have taken the world by storm, this revolutionizing technology has reshaped multiple spheres of human life including medical diagnostics.AI has advanced over the course of time from natural language processing, which allows the computer to extract meaning from human language to machine learning which allows the computer to learn as human does, and finally to deep learning. Deep learning focuses on the expansion of machine learning and consists of neural networks of three or more layers that mimic the human brain more accurately [1]. The advancements in medical diagnostics such as new imaging technologies, laboratory tests, and genomic studies are huge however, they all require human interpretation and this is where AI can help. The capability of AI to analyze large amounts of data has led to huge advancements in medical diagnostics. AI algorithms can now analyze large amounts of patient data such as medical history, laboratory test results, biosignals such as ECG, EEG, EMG, EHR, and medical images such as X-rays, CT scans, DXA, and MRIs quickly and accurately and provide a timely diagnosis to aid doctors [2]. Timely and accurate diagnosis in the field of medicine is of utmost importance. This leads to early treatment of the patient which has the benefits of improved treatment efficacy and patient outcomes. Early treatment also leads to reduced complications of the disease and thus prevents disabilities leading to improved quality of life of the patients and reduced healthcare costs which would have otherwise been spent in longer hospital stays and invasive procedures. At a broader level early diagnosis has a huge impact on the prevention of communicable diseases from spreading, preventing outbreaks, and safeguarding population health. The most prominent use of AI is in medical imaging, radiomics is the extraction of a large number of image features from a medical image by an AI tool, these features could be shapes, areas, and histograms of image pixels in the region of interest.[3] A recent study comparing a deep learning model and human physicians including thoracic radiologists in detecting a nodule on chest radiographs showed that AI performed better than 15 out of 18 doctors. AI performed better than 16 of 18 doctors in radiographic classification and also preserved a high specificity of 95.2% compared to 70.4% of physicians. [4]. Computational pathology uses AI in identifying histopathology slides directly rather than relying on a pathologist. It has also allowed researchers to detect histological features that weren't detected

by the eye alone. [5] AI is vastly used in clinical genomics, for example, gene expression can be analyzed using machine learning [6]. Cancer can be diagnosed early by the technique of radio genomics which combines radiographic images and genetic studies for early diagnosis of cancer. It is also used to identify previously unknown genetic variants, predict disease susceptibility analyze mutations and guide treatment strategies [7]. By combining multiple data sources healthcare providers can have a comprehensive understanding of patient's health and the underlying causes of their symptoms. These recent advances are so groundbreaking that they have led to an ongoing discussion about AI replacing clinicians entirely. However, this is still a long feet. A limitation of AI called the 'hallucination effect, is when the information generated looks very plausible, but it is infact inaccurate or unsupported by evidence [8]. This might be becuase AI models depend on large quantities of high-quality and labeled data to be effective, however medical data is often fragmented, incomplete, or unlabelled [2] a constraint that is added to by the need for strict privacy protection. There might also be a bias in the AI algorithms if they are trained on data that is not representative of the population. Although emotionally intelligent AI tools have been made they cannot substitute a human doctor-patient relationship.In addition there are ethical concerns. AI models operate as black boxes and their decision-making processes cannot be understood, hence a lack of transparency. Privacy concerns of health seekers might not always be satisfied either. Therefore it seems very unlikely that AI is going to replace human doctors any soon. However, we can think of AI as a gadget that helps healthcare workers in their job. The only path forward in this new era of AI is a collaboration between healthcare workers, AI experts and researchers in making the AI tools more proficient. A dedicated effort by healthcare workers to familiarise themselves with the working of these new tools and to integrate AI into medical education to equip future healthcare workers with AI literacy.2

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