Commentary

The Pursuit of Healthcare by AI: Thoughtful Delivery Needed

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Allowing unrestricted access to medical data and generating tools for use by non-licensed experts in healthcare, leading to autopilot of AI, may endanger healthcare in the long run. In this frenzy to adopt various models in medical delivery, there is a real risk of self-sabotage in both the virtual and real worlds. As physicians remain at the interface between man and machine in health, the wait for deep learning in medicine appears to be over, though the long-term implications are yet to be witnessed. To what extent do we indulge the possibilities of AI in healthcare?

Artificial intelligence (AI), technically machine learning (ML), first proposed in the 1950s, remained as a niche branch in computer science. Breakthroughs in Central Processing Units (CPUs) for core computational processes and "Graphical Processing Units" (GPUs), which process instruction sets in parallel in the "cloud," allowed for rapid iteration of large data sets. Healthcare has several potential applications for ML, given the volume of data, both in clinics and the enterprise. Despite the slow uptake and resistance from several quarters, its gradual impact in medicine is now a tangible reality.

ML in dermatology involves "computer vision," viz., algorithms designed to help computers interpret real-world images. Training sets (data corpora) require a continuous supervised process or, alternatively, an unsupervised form of learning. Convolutional Neural Networks (CNNs) adaptively learn spatial hierarchies of features from images. Deep Learning (DL) algorithms learn from raw data and improve their performance over time. Transfer learning (TL) involves taking a pre-trained model followed by fine-tuning it for a specific task, such as identifying a particular type of skin lesion. This approach can significantly reduce the amount of data required to train effective models in dermatology, where large, annotated datasets are often scarce. Despite their potential, these algorithms, if trained on unrepresentative data, suffer from data bias and misdiagnose in colored skin.[1] They may overfit, i.e., complex models may perform well on training data but fail to generalize to

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new, unseen images. Finally, the "black box" nature of DL models lacks transparency about their workflows around arriving at a particular diagnosis, complicating clinical decision-making. Parallel data training is one way to “blind” one set from the other to optimize maximal algorithm output.

Training datasets for common medical conditions are easily available; conversely, rare medical conditions lack structured sets. Synthetic datasets (with anonymisation) have been proposed as an interim solution to address this without breaching patients' confidentiality, although specific examples in dermatology require prospective validation.[2] It can be challenging to validate synthetic data to determine whether it accurately mimics real-world data.

Machine learning at scale requires massive computational and power resources to achieve meaningful outputs. Hence, this creates a significant moat for most, except well-funded corporations with ready access to financial resources. Data aggregation, without adequate privacy and security guardrails, remains unaddressed as a matter of serious concern, especially for data mining. These problems will be exacerbated with the computational advancement through better GPUs for text and multimedia (audio, video) generation based on specific prompts.

Personalised “humanoid chatbots” are likely the natural progression in digital health. The drawback is obvious, as patients are likely to develop an emotional connection with virtual assistants. Biometric information (retinal scans, facial data, and whole-body scans), if merged with existing data training sets, is an additional concern, especially for totalitarian controls without adequate legal frameworks.[3] There is an urgent need to pause and reflect upon which direction to pursue in the applications of AI.

Commercial entities are marketing AI as the panacea for solving teething medical issues related to human resources and expediting healthcare delivery. The intent is laudatory, but the execution appears without “res ipsa loquitor.” Distinct specialities require differential applications of AI. For example, radiological images are standardised and straightforward for AI tools to triage and prognosticate or utilise predictive algorithms for the early detection of medical emergencies such as pulmonary embolism. Despite training on open-access data, it has been demonstrated to selectively outperform an average clinician/student[4][5]. Similarly, in dermatology, DL algorithms for the differential diagnosis of common skin diseases were found to have been superior in performance to primary care physicians (PCPs) or nurse practitioners (NPs), and comparable to a board-certified dermatologist, disturbingly promoted with the ability to detect early cutaneous melanomas[6].

The downsides of this approach are obvious; indiscriminate use of “medical-grade” mobile applications for self-diagnosis will only encourage pseudo learning and (dangerously) delay expert consultation for skin lesions mistaken as “benign”. This has led to an increase in “convenience medicine,” and societal implications around the breach of the sanctity of the doctor-patient relationship may push the practice of medicine to an even more precarious edge. This, therefore, remains a banal pursuit of a corporation-led (both funded and lobbied) healthcare delivery with unnecessary disruption and potentially overlooks serious infectious/communicable diseases.

The central question for policymakers remains: Will AI be able to assist in delivering equitable healthcare globally? For example, conditions such as acral lentiginous melanomas, particularly in skin of color, with a delay in diagnosis, have unacceptably high mortality. Who assumes the responsibility, especially in these scenarios?

AI in healthcare is a solution looking for a problem. It is touted to ease administrative bottlenecks, reduce long wait periods by deft and appropriate screening, raise alarms when necessary, with the express aim to optimise outcomes (survival) and “inexpensively” provide universal access and good healthcare to all. It has also been promoted as a virtual consultant alongside the physician. In several healthcare systems, high patient loads lead to physician burnout and likely lapses in patient care. However, incongruent evaluation of signs (by algorithms trained on incomplete data sets) is a concern. They also mandate transparency in AI algorithms, ensuring that healthcare professionals understand how these tools make their predictions.

The western templates for an “inclusive approach,” in the name of democratizing medicine and respecting patient autonomy, can lead to meaningless data generation and misuse. In this age of digital civilization, harnessing the inexorable AI for the greater common good to achieve best clinical practices should remain the stated priority.

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