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Perspective

The role of humans in the future of medicine: Completing the cycle

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Abstract: The progression of Artificial Intelligence (AI) has reshaped our understanding of intelligence, consciousness, and the human condition, challenging long-held assumptions about the mind and its relationship with machines. Starting with Alan Turing's Imitation Game, the narrative of assessment of AI has continually evolved. This historical context underlines the importance of moving beyond mere facts to confront philosophical questions about AI's role and limitations, especially in its capacity for consciousness and emotional resonance. In healthcare, the evolution of AI reflects a transformative cycle. Historically, medicine began as an empathic endeavor, where caregivers provided comfort amid limited knowledge. Over centuries, advancements in science elevated physicians to authoritative figures, creating a paternalistic doctor-patient dynamic. Today, with the advent of AI and technologies like the metaverse, healthcare knowledge is becoming democratized. Patients can increasingly access AI-driven diagnostics and interactions, creating a potential era of "*algorithmic paternalism*" where machines dominate the knowledge hierarchy. Looking to the future, as AI assumes cognitive and diagnostic responsibilities, the human aspect of medicine will gain renewed importance. Physicians will return to their foundational role as empathic caregivers, focusing on human connection and emotional support—qualities that AI, despite its advances, cannot fully replicate today. This shift completes a historical cycle, reaffirming the enduring value of humanity in medicine and positioning the physician as a central figure in the emotionally nuanced landscape of healthcare.

Keywords: metaverse; artificial intelligence; doctor-patient relationship; human-computer interaction; ethics

1. Artificial Intelligence and the consciousness paradox

The history of Artificial Intelligence (AI) is frequently associated with Alan Turing and his renowned Imitation Game, in which an intelligent machine would need to appear human to another observer. However, the study of the mind, and the connection between the mind, the brain, and the emergence of intelligent machines, predates Turing's work.

In his work published in *Mind* in 1950 [1], Alan Turing refers to Professor Geofry Jefferson, who delivered the Lister Oration at the Royal College of Surgeons of England on 9 June 1949. This oration was later published under the title *The Mind of Mechanical Man* [2]. In this paper, Jefferson makes the following statement:

> *"Not until a machine can write a sonnet or compose a concerto because of thoughts and emotions felt, and not by the chance fall of symbols, could we agree that machine equals brain—that is, not only write it but know that it had written it".*

This philosophical insight raises profound questions about evaluating the intelligence of a sentient mind. Merely because a machine produces a text does not

mean it is sentient or aware of its actions. The generative capabilities of AI cannot guarantee it suffers for its mistakes or can reflect on the consequences of its decisions. However, a paradox emerges: The same critique can apply to humans. We cannot definitively understand another person's consciousness unless we are that person. Thus, the question of whether AI can achieve sentience remains unanswered. Nevertheless, our shared human condition fosters a natural belief in each other's ability to feel, bridging the gap of uncertainty in human interactions.

In the Lister Oration, Jefferson also cites John Hughlings-Jackson, a neuroscientist born in 1835. Although Hughlings-Jackson requested his personal records be destroyed after his passing [3], Jefferson shares his perspective:

> *"It is a favorite popular delusion that the scientific inquirer is under a sort of moral obligation to abstain from going beyond the generalization of the observed facts, which is absurdly called 'Baconian induction'. But anyone who is practically acquainted with scientific work is aware that those who refuse to go beyond fact rarely get as far as fact; and anyone who has studied the history of science knows that almost every great step therein has been made by the 'anticipation of Nature'—that is, by the invention of hypotheses which, though not verifiable, often had very little foundation to start with".*

The quote by Jefferson offers a profound critique of the scientific method. While the "Baconian induction" is meant to be centered on facts and avoid going beyond the specific findings of any given research, Jefferson argues that the driving force behind science is an almost unnatural invention of unverifiable hypotheses that serve as a foundation. This quote encourages scientists to use their findings to create a broader generalization that can help guide humankind in a more holistic fashion.

From these authors, we learn two essential lessons. First, we must aim to look beyond surface facts and critically evaluate the paths we are taking; second, there are certain philosophical questions, particularly about the mind, intelligence, and consciousness, that remain beyond our grasp. When it comes to the effects of AI in healthcare, these two considerations will become key in the coming years.

Reflecting on the present, we now find ourselves in a world where humans must prove their humanity to machines, such as through CAPTCHA tests on websites, to access information and sensitive data. Conversely, automated software often attempts to bypass these tests using various techniques. This ironic reversal—machines challenging humans—illustrates how we have turned the imitation game on its head.

2. The evolution of medicine alongside technology

AI's advent is bound to reshape many spheres, including healthcare. In antiquity, humans cared for one another under challenging conditions. Limited medical knowledge meant reliance on empathy and basic remedies. Over time, with reason and scientific advances inspired by Aristotle, Francis Bacon, and many others, humanity developed complex healthcare systems capable of delivering quality care.

As knowledge expanded, the medical profession gained prominence, elevating physicians to respected societal figures. However, this advancement also created an asymmetry in the doctor-patient relationship, where one party held knowledge and

authority, while the other held only pain and suffering. This dynamic became known as a "paternalistic" relationship, with the patient viewed as weak and "infirm" [4].

Today, emerging technologies such as AI and the metaverse are transforming human interactions. On one hand, the metaverse is a collective virtual shared space, created by the convergence of virtually enhanced physical reality and persistent online virtual environments [5]. The ideal of the metaverse typically includes augmented reality (AR), virtual reality (VR), and digital worlds where users can interact, socialize, create, and exchange content. The metaverse is often envisioned as a fully immersive, interconnected digital universe. On the other hand, AI refers to the simulation of human intelligence in machines that are programmed to think, learn, and problem-solve autonomously. The union between AI and the metaverse in the realm of healthcare offers endless possibilities, that until now only appeared in science fiction.

While the applications of the metaverse in medicine is still in its infancy [6], AI models are currently being used for a wide variety of applications in medicine, ranging from detecting findings in CT scans [7] to clinical decision-making [8] or risk communication [9]. Implementation of AI is presumed to evolve in epochs of ascending relevance [10], but have been shown to already provide cognitive support for physicians and have proven to be on par with certain clinical skills, for example in emergency medicine [11]. A recent systematic review on the uses of AI in surgery suggests AI can provide benefits such as improved decision-making, risk assessment, efficiency, as well as reduced labor and work time [12]. As these trends continue, valuable healthcare information will soon be widely accessible, reducing dependence on human doctors. Meanwhile, various aspects of the metaverse in medicine, such as educational and teaching purposes, surgical simulations, conferences and meetings, are under research [13]. This means that soon patients will be able interact with AI entities in a VR clinical setting, which will gradually become more realistic and productive. While this offers great promise in terms of availability and efficiency, it also bears the risk of tilting the asymmetrical relationship toward AI and ushering in an era of "algorithmic paternalism", in which the algorithm can be seen as an all-knowing entity that cannot be questioned [14]. Although some studies have shown a positive outlook on AI [15], steps need to be taken to ensure that AI has a positive effect on person-centered doctor-patient relationships [16]. As AI becomes more reliable and accurate, improving workflow, the risk of erosion of the doctor-patient relationship remains to be seen [17].

3. Frameworks for Artificial Intelligence and metaverse in healthcare

In this area, frameworks can help improve adaptation, offering insights on the best approach to evaluate AI in healthcare. Initiatives such as "Translational Evaluation of Healthcare AI (TEHAI)" review capability, utility and adoption, but can sometimes present a narrow view in contrast with the long term and wide spanning effects of AI on healthcare [18]. Other frameworks such as CONSORT-AI and SPIRIT-AI offer guidance in relation to reporting standards, but again are limited to

only one area of AI in healthcare, with a focus on how AI research should be carried out and reported upon [19].

Developing AI and metaverse technologies will gradually become more relevant in medicine, but this transition demands caution and adherence to ethical guidelines tailored to healthcare [20]. Critical issues include data safety, informed consent, transparency, validation, liability and regulation [21]. Other issues encompass trust-building, AI literacy and effective communication. Bias must also be addressed, as AI can misinterpret human values based on skewed data, akin to a child learning from flawed input. A recent study found that certain generative AI models learned about beauty standards from unfiltered datasets, leading to the production of exaggerated images of the female body that could induce unrealistic beauty expectations when shared on social media [22]. Bias can also be present when AI models are trained on underrepresented populations due to societal imbalances and lack of diversity [23]. Other effects AI might have on the doctor-patient relationship are reviewed in a report by Brent Mittelstadt, and include the dilution of the patient's account of well-being, inequality of access to high quality care or automation bias or loss of skill [24]. In the report, commissioned by the Steering Committee for Human Rights in the field of Biomedicine and Health (CDBIO), the council recommends establishing robust ethical standards to ensure transparency, bias mitigation, confidentiality, and clinical efficacy in AI applications within healthcare. It emphasizes the need for intelligibility requirements to support informed consent, the creation of a public register for medical AI systems to enhance transparency, and systematic audits for fairness and bias. Moreover, it advocates for clear communication of AI recommendations to patients, alongside guidelines for doctors to explain AI-driven decisions. Among the complex duties of physicians in the future, a novelty will be the need to monitor and nurture the emotional and psychological impacts of AI on patients [25].

The World Health Organization (WHO) has published several reports regarding AI and large multi-modal models. These reports mention the ongoing debate over whether both general-purpose foundation models and healthcare applications using them should be assessed, with technology companies lobbying against oversight of the foundation models, but critics argue that this would allow developers to evade responsibility for risks like bias, false information, and privacy breaches, highlighting the need for shared accountability between developers, providers, and government regulations. According to the WHO, additional required measures emphasize the prioritization of human autonomy, well-being, transparency, accountability, equity, and sustainability to ensure fair and safe implementation [26]. As expressed by Stephen Hawking and echoed in the same paper: "Our future is a race between the growing power of technology and the wisdom with which we use it". This quote emphasizes the need to skillfully and swiftly adapt healthcare to these new technologies with wisdom and care.

The intricacy of these emerging innovations becomes evident as soon as one explores the vast implications of a combination between AI and the metaverse in healthcare, which are poised to profoundly shape the future of humanity. As mentioned by Jens Christian Bjerring and Jacob Busch, the opaque nature of AI could be the beginning of an era of black-box medicine, potentially diverting patients and caregivers from the path of informed decision-making and shared deliberation

between practitioners and patients [27]. Given the subtlety involved in evaluating AI in healthcare, this process will need to be an ongoing evolution that unfolds through clinical application [28].

4. The role of humans in the future of medicine

At the dawn of AI in healthcare, we ask ourselves the question posed by Enrico Coiera: What does it mean to be a doctor [29]? Soon, machines will surpass human knowledge in medicine and will be capable of providing a fully virtual, AI-driven healthcare environment. In this scenario, the quality of care must be upheld. While the technical challenges of achieving this are actively being addressed, the fundamental questions of why we should pursue this and how it will transform medicine remain unanswered.

At this juncture, we must heed the wisdom of figures like Hughlings-Jackson and challenge the status quo. A vital question emerges: What should be the role of human endeavor in the future of medicine? Just as Hughlings-Jackson conveys his personal opinion in his work [30], we can explore the future through the lens of our own perspective on the nature of the doctor-patient relationship. With healthcare knowledge becoming widely available, the task of diagnosis—etymologically, discerning the problem "through knowledge" (διά [diá, "through"] + γιγνώσκω [gignṓskō, "to know"])—will increasingly shift to AI. Power lies in knowledge, and as knowledge transfers to intelligent machines operating in virtual environments such as the metaverse, the human doctor's role may diminish in relevance. On the other hand, while the power of knowledge is transferred to AI technologies, humans can focus on communications skills, which can serve as their natural advantage over AI systems, if care is given to training. These skills include a vast array of abilities such as emotional awareness, empathy, patience, conflict resolution, feedback and validation of the patient's feelings. Other abilities incorporate active listening, verbal and non-verbal communication [31]. Studies have shown that doctors trained in communication skills improve patient outcomes [32]. Patient-centered techniques such as the "ask-tell-ask" approach help provide information without overwhelming the patients, while exploring the patient's emotional response after giving the information can be another beneficial instrument [33]. The patient-centered experience and the needed skills are likely to become more central in the training process of doctors in the future.

5. Completing the cycle

Ultimately, as machines gain comprehensive knowledge and expertise, human physicians must return to their roots. While technical solutions become universally available, the physician's human condition—offering connection and empathy—will remain instrumental. Though AI can simulate empathic language, the human touch provides a depth AI cannot replicate today. This, then, will be the central focus of the physician's role in the future. The cycle will complete itself as physicians return to their original role: human caregivers offering compassion, connection, and care.

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