

The Unofficial Guide to Medicine Essay Competition

Discuss the role of Artificial Intelligence (AI) in medicine. Is it possible to replace human doctors or any aspect of medical care with robots?

Artificial Intelligence in Medicine: Job Killer or Life Saver?

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Ask any doctor about their views on Artificial intelligence (AI), and they are likely to envisage futuristic computers making autonomous diagnoses, or advanced screening tools predicting risk of diseases from genetic analysis. AI is not commonly viewed as something tangible or contemporary, but rather more futuristic, radical and almost omnipotent. With the recent launch of the national AI laboratory by the Health Secretary, tasked with propelling the NHS to the 21st century and beyond with its £250m funding, one might wonder: what is AI and why does it matter?¹

1.1 What is AI?

According to Professor John McCarthy, widely regarded as the father of AI, it can be defined as “the science and engineering of making intelligent machines”.² Put simply, it is a field of computer science that is about making machines cleverer and more efficient at performing certain tasks. This could result in boosting of productivity in the workplace.

Nowadays AI tend to mean computers that are capable of refining their algorithms when being fed more and more information from which to learn, thus producing better and more accurate results. This process, often referred to as machine learning (ML), is akin to what humans do when we develop our natural intelligence, most prominently at a young age.

1.2 Fears and misconceptions about AI in healthcare

AI is often portrayed as hyper intelligent, with headlines linking it to almost any industry imaginable. Naturally, this raises fears over its potential to eliminate the need for humans to do work.

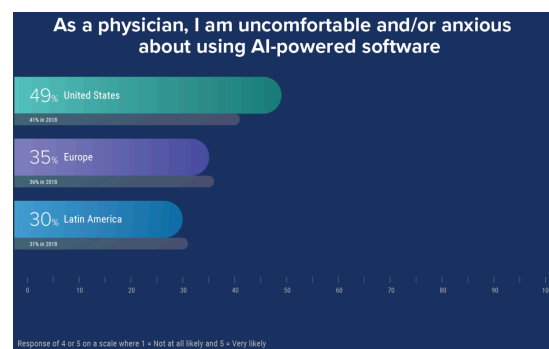


Figure 1: Screenshot from Medscape Survey³

A recent Medscape survey revealed over a third of doctors interviewed globally harboured anxiety about using AI-powered software(Fig.1).³ A similar number also felt their role might be undermined by AI.

Here is why doctors are not at risk of being fully replaced by machines anytime soon: computers have yet to demonstrate an ability to show empathy or compassion, making them unsuitable for jobs that value human interaction, such as nurses and doctors. Although some people show empathy more expertly than others, being able to express such emotions will always be required in medicine.

2. AI in medicine: why is it important & what role can it play?

That being said, there is more to medicine than simply expressing empathy. AI-powered computers, no matter how smart, may not be able to break bad news to patients the same way humans do, but that does not mean they are completely redundant. This essay aims to provide an overview of several specific uses of AI in medicine and how it is likely to develop in the future.

2.1 “How can I help?” – the rise of Chatbots

A vital part of the NHS relies on effective triaging of patients, ensuring A&Es are not being overwhelmed and resources are not wasted. Much of this burden falls on the NHS 111 hotline. With the hotline handling over 1.5 million calls in November 2019 alone, which is 13% higher than one year ago, is it possible to make this process more efficient and sustainable?⁴

Chatbots could be the answer. Chatbots are software that can conduct conversations, often using natural language processing to understand and respond appropriately to human messages.⁵

Babylon Health, a London-based medtech startup, has recently started trialing a chatbot service as a 111 alternative(Fig.2).⁶ It is easy to imagine other scenarios

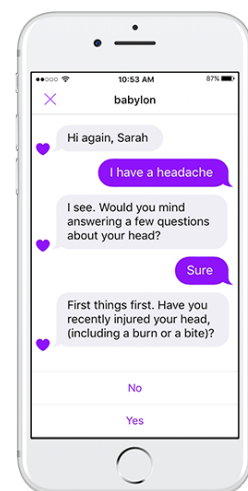


Figure 2: Simulation of chatbot in use⁶

where chatbots can be used to replace human services, e.g. requesting repeat prescriptions, making GP appointments. This type of work requires little empathy, which is why they are more susceptible to being replaced.

This type of technology has several benefits. Chatbots can work round the clock and handle more conversations than the limited number of call handlers ever can. This level of scalability also means greater cost savings and productivity.⁵

Nevertheless, chatbots are not perfect. They are only as good as their algorithms, and their ability to pick up nuanced verbal cues may be limited. The silver lining is that these technologies often improve with more time and experience.⁷

In the context of a cash-strapped NHS, the benefits of chatbots are hard to ignore and worthy of further evaluation. Mitigating the flaws, however, will be key to deploying it on a large scale.

2.2 Doctors and AI working side-by-side in harmony: Fantasy or new reality?

Pattern recognition, particularly image recognition, is a feature shared by both AI and human intelligence.⁸ Google's DeepMind, a world-leading institute in AI, has made waves in the world of ophthalmology recently, when they claimed their algorithm could identify common eye pathologies as accurately as any top ophthalmologist.⁹ The software was developed in partnership with Moorfields Eye Hospital in London and if approved, will be offered to Moorfields' consultants as a diagnostic aid.¹⁰ This is an example of AI complementing doctors' workflow by providing useful diagnostic information, likely resulting in faster and more accurate diagnoses.

The power of pattern recognition goes far beyond simple image recognition. Another example is text analysis. When coupled with natural language processing techniques, trawling through years if not decades worth of electronic health records (EHR) within the space of minutes is no longer a pipedream. Case in point:

Google recently published a paper in *Nature*, detailing their algorithm for predicting risk of in-hospital mortality, prolonged length of stay and readmission rates using EHR information.¹¹ It was a proof-of-concept study, but the results were promising.

Nevertheless, these announcements help solidify AI's image as a futuristic gimmick in the medical community. Unbeknownst to most people is that development of AI in medicine actually started decades ago. Decision support systems using AI existed in as early as the 1970s, one of which was MYCIN. MYCIN was developed to help diagnose meningitis and bacteraemia based on reported symptoms and medical test results.¹² However, early optimism quickly faded, and it was never deployed, not because of its performance, but a lack of consideration for how doctors might use it.¹³ Philip Leith, an expert on AI, summed up why MYCIN failed to live up to its potential, "if the tool was not directly helpful to how they (doctors) wished to work, then it would simply not be used."

The story of MYCIN serves as a reminder that despite its proven track record of delivering accurate results, there is still a long way to go for AI to become a major force for change. In order for that to become a reality, it needs to deliver novel solutions for problems facing doctors today in a user-friendly way.

2.3 AI can bring healthcare to those who need it the most

The truth is: AI is unlikely to replace doctors anytime soon. However, for many parts of the world, just being able to see a doctor may be a luxury. A 2017 report by the World Health Organisation and the World Bank showed only half of the world's population have access to essential health services.¹⁴ This problem affects both low and high-income countries.

Let's say a general practitioner in a rural area were seeing a patient with an eye condition, and he/she had little to no access to specialist care and could only

perform basic fundoscopy. One way to address this problem may be to deploy a remotely accessible AI software. It could give the clinician limited but useful advice on possible pathologies and management options, all without any human intervention. Based on the previously mentioned uses of AI, this hypothetical scenario is already within the realms of possibility.

This type of democratisation of services through AI is already happening to other industries, such as finance. The CEO of PayPal once pointed out there were 2 billion people around the world who were living outside the mainstream financial system.¹⁵ Until recently, many of these people had little to no access to banking services. AI-powered algorithms are now being used to automate processes, allowing greater access to these services, e.g. determining credit limit, identifying fraud, etc.^{16,17} The rollout has not been flawless, for instance algorithms have been shown to demonstrate biases and discrimination.¹⁸ Clearly, there is still room for improvement, but this is proof that fulfilling the goal of bringing healthcare to previously unreachable communities is more attainable than most people think.

3. Conclusion

The strength of AI lies in its versatility and scalability by bringing a wide range of expertise to a larger audience. It can give doctors greater insight into pathologies, provide astute diagnostic advice, and even fill the gaps left behind by a global shortage of doctors. However, the downsides need to be addressed accordingly. What to do with displaced workers, likely non-clinical ones, or the erosion of human interaction are just two examples. Having said that, in the same survey mentioned at the beginning of this essay, almost 70% of all doctors agreed that AI will likely “make their decisions more accurate” and “allow them to spend more time on other important tasks”.³ The best of AI is yet to come, but understanding its strengths and weaknesses is a good place to start.

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