

Artificial Intelligence for Healthcare: A Structured Review

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ABSTRACT

The study of artificial intelligence (AI) spans a wide range of academic disciplines and has its roots in many different fields, including logic, statistics, cognitive psychology, decision theory, neuroscience, linguistics, cybernetics, and computer engineering. The modern science of artificial intelligence was born with a modest summer workshop held at Dartmouth College in 1956. Since then, AI applications enabled by machine learning (ML), an AI subdiscipline, include Internet searches, e-commerce websites, products and service recommender systems, picture and speech recognition, sensor technologies, robotic devices, and cognitive decision support systems (DSSs). Similar to how earlier general-purpose technologies like steam engines, railroads, electricity, electronics, and the Internet have changed society and the economy globally, it is projected that as more applications are integrated into daily life, AI will have a revolutionary impact on these systems. Future workplaces may use novel AI applications, which raises significant concerns for worker safety and health. This essay examines the history of AI, the usage of ML techniques, and new AI applications that are being integrated into physical things like sensor technologies, robotic devices, or intelligent DSSs. The management of human-machine interactions and some of the potential job displacement caused by automation caused by the deployment of AI technologies are also reviewed. A proactive rather than reactive approach to occupational research and practice will result from exercising strategic foresight regarding AI workplace applications. It will be easier to reduce the negative consequences of AI on worker safety, health, and well-being if workers are aware of the opportunities and difficulties that AI presents for the future of work.

Keywords: Artificial intelligence, Health care, Machine learning.

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INTRODUCTION

What's Artificial Intelligence (AI)?

AI is not a recent innovation. John McCarthy, a computer scientist at Stanford University, first used the word in 1956 while serving as the director of the Dartmouth Summer Research Project. The AI technology has gone through numerous ups and downs since then.¹

Artificial intelligence refers to the methods used to teach computers how to think, reason, perceive, infer, communicate, and make decisions that are comparable to or better than those made by people.

With improvements in computer processing power, access to massive data sets required to train AI systems and the capacity to process them, as well as discoveries in algorithm designs the building blocks of AI processing the discipline began to make significant strides forward starting in 2011.²

The technologies that make up artificial intelligence (AI) serve a variety of purposes, depending on the task or issue at hand. People talk about AI frequently refer to one or more of these computing technologies, which you may already be utilizing at home or business for things like thermostats, lighting management, or personnel optimisation.³

Robotic engineers are improving robots' capabilities and emotional reactions to situations. Robots with emotional intelligence are often referred to as social or companion robots. Robots are encroaching on our homes, businesses, and places of healthcare delivery even though they haven't yet reached the point of taking over. Social robots are created to respond to human interactions in a way that makes them human.⁴

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Robots are being developed by researchers all across the world to enhance therapeutic telemedicine applications, reduce suicide rates, and more. The role of nurses in providing care will evolve as robots learn to carry out nursing tasks such as ambulation support, vital sign measurement, drug administration, and infectious disease protocols. According to research, between 8 and 16% of nursing time is wasted on tasks that should be assigned to others or non-nursing activities.⁵

How could artificial intelligence transform healthcare?

Although artificial intelligence's current nursing and healthcare applications are impressive, its potential applications some of which are already possible are remarkable.

Brain-computer interfaces (BCI)

In the situation where a person loses their ability to communicate verbally and physically, BCI could be completely life-changing. By charting the neural activities associated

with the intended movement of one's hand, BCI could then send messages through a device like an iPad. This type of technology could come in key for individuals with ALS, a patient who has suffered a stroke, is experiencing locked-in syndrome or other neurological trauma.

Advanced radiology technology

The goal is that one day AI will be used in a similar way to look at medical images taken by MRI machines, CT scanners, and X-ray equipment, just as it is currently used to recognize faces or specific things in photos. This could facilitate quicker diagnoses while also avoiding more intrusive diagnostic procedures like biopsies and exploratory surgery. Such a capability would also benefit underserved regions, where a lack of radiologists and other professionals may be a problem.

Quicker, more precise pathology

The results of pathology determine about 70% of decisions regarding care. Diagnoses can be made more quickly by applying AI to data from notes, tests, and photos. Also, because of the advancements in technology, it is now possible to analyze incredibly big digital photos down to the pixel level, enabling providers to spot details that the human eye would miss.⁶

Implementing AI in nursing

Although researchers have been utilizing AI for many years, its application in daily life is still relatively new. When nurses use AI, such as clinical decision tools, they can quickly evaluate vast volumes of data to identify hazards, suggest interventions, and improve workflow. However, nurses' assistance must overcome limitations if AI is to truly alter nursing practice.⁷

Although researchers have been utilizing AI for many years, its application in daily life is still relatively new. When nurses use AI, such as clinical decision tools, they can quickly evaluate vast volumes of data to identify hazards, suggest interventions, and improve workflow. However, nurses' assistance must overcome limitations if AI is to truly alter the nursing process. The application of AI in nursing is not an exact science. A thorough analysis of the most practical tool, interaction with the nurses who will use it, and nurse participation in its deployment and evaluation are necessary for success. Nurses who understand the differences in using AI clinical decision support, along with AI-identified risk factors, are critical to developing and using reliable solutions.⁸

Challenges

Although AI offers promising solutions to nursing, it's not without its drawbacks. For example, just because you can use an AI tool, doesn't mean you should. Many traditional tools perform similarly (or outperform) their AI counterparts depending on the application, such as in predicting the mortality of older patients who have undergone hip fracture treatment. Data quality and sources, as well as modeling validation, have shown mixed results. Novel robotics can be met with resistance.⁹

Cultural change is always a factor when introducing something new, but robotics may be misunderstood or considered invasive if not implemented with caution. Healthcare professionals also may be fearful that AI will result in job loss. This may be true in the future, but current tools and those under development don't replace human jobs; they're intended as enhancements. In addition, many have concerns about confidentiality and privacy related to AI use. As with technology that handles sensitive information, risks exist. However, with careful planning and implementation, these risks can be mitigated.¹⁰

Transforming care

AI is transforming healthcare and nurses' roles in care delivery. As we face a global pandemic, the development and implementation of AI-driven technologies aim to address our unique issues, such as disease presence in asymptomatic patients. Nurses must contribute to the advancement of AI to ensure development that advances the nursing role and focuses on providing person-centered care.¹¹

The Future of Health Care in AI

In the healthcare options of the future, AI, in our view, will play a significant role. It is the key capability underlying the development of precision medicine, which is universally acknowledged as a critically needed improvement in healthcare. Precision medicine is primarily enabled by machine learning. We anticipate that AI will eventually be able to excel in that field as well, despite the difficulties encountered in early attempts to provide diagnosis and treatment recommendations. The majority of radiology and pathology images will probably be reviewed by a machine at some point given the tremendous advancements in AI for imaging analysis. Already used for interacting with patients and recording clinical notes, speech and text recognition will become more prevalent.¹²

The biggest issue facing AI in many healthcare sectors is not whether the technologies will be effective but rather how to ensure their acceptance in routine clinical practice. Regulators must approve AI systems before they can be widely adopted, and they also need to be integrated with EHR systems, sufficiently standardized so that similar products function similarly, taught to clinicians, paid for by public or private payer organizations, and updated over time in the field. Although these difficulties will eventually be resolved, they will take far longer than the technologies' maturation. In light of this, we anticipate limited usage of AI in clinical practice within 5 years and more widespread use within ¹³

Furthermore, it is increasingly obvious that AI systems will not substantially replace human clinicians in patient care but rather support them. Human physicians may eventually gravitate towards duties and work arrangements that make use of particularly human abilities like empathy, persuasion, and big-picture integration. Those healthcare professionals who refuse to collaborate with artificial intelligence may end up being the only ones to lose their professions in the future.¹²

CONCLUSION

The Application of AI in Healthcare Clearly, many gaps and grey areas in this domain need to be filled. The primary obstacle is not the technology itself, which is expanding, changing, and finding new applications; rather, it is the legal system, which manifestly lacks adequate rules and some political, ethical, and financial changes. Thus, the fundamental question is: Is this technology even remotely appropriate for healthcare considering its nature? Is the current legal system suitable for regulating AI in terms of its effectiveness and safety?

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