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USE OF ARTIFICIAL INTELLIGENCE (AI) IN HEALTH CARE SYSTEM

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ABSTRACT

Artificial Intelligence (AI) has become a pivotal element in transforming various sectors, particularly in healthcare, where its advancements are most notable. This paper examines the current landscape of AI integration within the healthcare sector, highlighting its applications, advantages, challenges, and prospective future trends. Significant areas of AI application in healthcare include medical imaging and diagnostics, drug development, personalized medicine, virtual health assistants, predictive analytics, and AI-enhanced decision support systems. Although AI presents significant opportunities for improving patient care, lowering costs, and advancing medical research, it also necessitates careful attention to ethical considerations, data privacy, and regulatory compliance to ensure effective implementation. The incorporation of AI in healthcare has substantial potential to enhance patient outcomes, improve diagnostic accuracy, support precision medicine, and streamline healthcare management. Nevertheless, to fully leverage AI's capabilities, it is crucial to foster interdisciplinary collaboration among AI specialists, healthcare providers, policymakers, and patients to guarantee the responsible and equitable use of AI technologies within the healthcare framework. This paper makes an effort to understand the use of AI in health care system with its advantages.

KEY WORDS: *Medical field, accuracy, artificial Intelligence, health care system, Genetics.*

INTRODUCTION

In recent years, artificial intelligence (AI) has achieved remarkable progress, impacting a variety of sectors such as finance, transportation, and manufacturing. One sector that has experienced a profound transformation due to AI

technology is healthcare. This article seeks to explore the diverse applications of AI within the healthcare industry, highlighting its numerous benefits while also addressing the challenges associated with its integration. Furthermore, the emergence of AI-driven devices and platforms is ushering in a new era of precision medicine, where treatments are tailored to individual patients based on their unique genetic makeup, medical history, and lifestyle factors. This shift towards personalized medicine holds significant potential for improving patient outcomes, lowering healthcare costs, and enhancing our understanding of complex medical conditions.

As we explore the realm of artificial intelligence in healthcare more thoroughly, it becomes clear that this groundbreaking technology also introduces a variety of challenges and ethical considerations. Issues surrounding data privacy, algorithmic bias, regulatory compliance, and the responsible application of AI in clinical practice remain significant, highlighting the necessity for robust governance frameworks and collaborative engagement among healthcare professionals, data scientists, policymakers, and ethicists.

HISTORICAL BACKGROUND

Artificial Intelligence (AI) is a comprehensive term that refers to a vast array of research aimed at stimulating intelligent behavior without direct human intervention. The origins of AI can be traced back to the 1950s, particularly with the introduction of the "Turing Test." Alan Turing raised a seemingly straightforward question: could a machine be designed to perform tasks and make decisions that are indistinguishable from those of a human? This inquiry shifted AI from a vague idea to a clearly defined objective for researchers and intellectuals of that era. While Turing initiated the discussion, many scholars attribute the foundational development of AI to the Dartmouth Conference on AI held in the summer of 1956. This gathering brought together the foremost data scientists, engineers, and mathematicians from around the globe to exchange ideas and collaborate, all with the aim of establishing a framework for the practical implementation of AI. Numerous experts at the conference asserted that AI was indeed feasible and, with remarkable foresight, predicted that it would eventually match and even exceed human intelligence.

The roots of industrial AI can be traced back to the 1950s, when the primary objective of these early systems was to enable machines to replicate human decision-making and actions. In 1955, General Motors introduced the first robotic arm. Subsequently, in 1964, Joseph Weizenbaum created Eliza, the first chatterbot, at the MIT AI Laboratory. Eliza's system identified key words in the input text and generated responses based on specific reassembly rules, allowing it to simulate a conversation akin to that of a human therapist. Research in AI saw significant growth during the 1960s, with many experts considering Shakey to be the decade's most notable achievement. Shakey was the first robot capable of understanding human instructions and executing actions based

on them. These advancements transformed the research landscape, demonstrating that genuine AI was not merely a distant aspiration but a legitimate field of inquiry yielding concrete outcomes.

The emergence of AI with significant medical applications began in the 1970s. In 1971, INTERNIST-1 was developed as the first artificial medical consultant. This system employed a search algorithm to generate clinical diagnoses based on the symptoms presented by patients. INTERNIST-1 marked a pivotal advancement in the role of AI in clinical research, as it demonstrated the potential to alleviate some of the diagnostic responsibilities from healthcare professionals and offered a tool for physicians to verify their differential diagnoses. By this time, the promising prospects of AI in medicine were evident, prompting the National Institutes of Health to sponsor the inaugural AI in Medicine conference at Rutgers University. The rapid growth of medical AI was partly fueled by interdisciplinary gatherings where researchers from various AI fields exchanged ideas and systems. One notable outcome of such collaboration was MYCIN, a system designed to assist physicians in selecting appropriate antibiotics for patients with infectious diseases. The next significant development occurred in the 1980s at the University of Massachusetts with the introduction of DXplain, a program aimed at aiding clinicians in making medical diagnoses. Clinicians could enter symptoms into the system, which would then provide a possible diagnosis. While similar to INTERNIST-1, DXplain expanded the range of clinical diagnoses it could generate and served as an early repository of current medical information for physicians.

The contemporary phase of artificial intelligence commenced in the early 2000s, marked by significant advancements in its applications within healthcare and everyday life. In 2007, IBM introduced a question-answering system named Watson, which successfully competed against top contestants on the television quiz show Jeopardy. This system utilized DeepQA technology, employing language processing to analyze data from diverse contexts and extract information from a multitude of sources to generate answers. This innovation opened new avenues for healthcare applications, allowing for inputs that extended beyond mere symptoms and enabling outputs that encompassed more intricate considerations than simple clinical diagnoses. For instance, in 2017, the Watson system identified RNA binding proteins linked to amyotrophic lateral sclerosis. Additionally, new systems were developed to enhance patient care in various ways. One such system, Pharmbot, was created in 2015 to educate patients and their families about medications and treatment procedures.

ROLE OF AI IN IMAGING AND MEDICAL DIAGNOSTIC

The incorporation of artificial intelligence technology has transformed the fields of medical imaging and diagnostics. Utilizing machine learning algorithms, healthcare practitioners can effectively detect irregularities in medical images, including X-rays, CT scans, and MRIs. This advancement results in quicker and more accurate

diagnoses, thereby enhancing patient outcomes. Furthermore, the continuous learning capabilities of AI algorithms promote sustained enhancements in diagnostic precision, minimizing the likelihood of misdiagnosis.

Predictive Analytics: The emergence of AI technology has enabled healthcare providers to transform their approach to patient care through the use of predictive analytics. By examining a wide range of patient data, including electronic health records (EHRs), genetic information, lifestyle choices, and environmental factors, AI algorithms can detect patterns and forecast the likelihood of specific diseases or health issues (Rajkomar, A. et al. (2018). This capability empowers healthcare professionals to implement proactive strategies and develop customized treatment plans, resulting in improved patient outcomes and alleviating pressure on the healthcare system.

AI in Drug Discovery and Development: The conventional process of drug discovery is often lengthy and expensive, with uncertain outcomes. In contrast, artificial intelligence offers a compelling alternative to streamline both drug discovery and development. By examining extensive datasets that include genetic data, disease trends, and molecular configurations, AI algorithms can more effectively pinpoint promising drug candidates. This methodology not only speeds up the drug development process but also enhances the chances of discovering innovative treatments for conditions that were once deemed untreatable, thereby transforming the pharmaceutical sector.

The Role of Robotics in Surgery: It is fascinating to observe how the combination of artificial intelligence and robotics has transformed the surgical landscape. These innovations have paved the way for minimally invasive techniques and have significantly enhanced the precision of surgical procedures. Robotic surgical systems, guided by AI algorithms, provide improved dexterity, stability, and control during intricate operations, thereby minimizing risks to patients and increasing surgical accuracy. Consequently, this advancement contributes to superior surgical results, quicker recovery periods for patients, reduced hospital stays, and a decrease in post-operative complications.

Fraud Detection and Cybersecurity: The advancements in technology within the healthcare sector are truly remarkable. Implementing fraud detection and cybersecurity protocols is vital for the protection of patient information, and it is reassuring to see the application of AI algorithms in this area. These algorithms can identify anomalies and patterns that may suggest fraudulent behavior or impending cyber threats, playing a key role in securing medical records and ensuring patient confidentiality. This, in turn, fosters and sustains trust between healthcare professionals and patients, which is critical for achieving optimal healthcare results.

Personalized Medicine and Treatment Plans: While it is challenging to formulate hypotheses regarding the effectiveness of clinical decision support software that relies on artificial intelligence, there is now substantial evidence indicating that, in certain situations, some systems can perform as well as, or even surpass, human decision-makers.

Nevertheless, artificial intelligence is not a panacea, as recent experiences during the COVID-19 pandemic have demonstrated (Heaven, 2021). In 2007, Weiner and his colleagues introduced the term “e-iatrogenesis” to describe patient harm resulting from information technology (Weiner, Kfuri, Chan, JB). Cabitza and his team have identified four major risks (Cabitza, R, Gensini). These include the potential for artificial intelligence to deskill healthcare professionals, whose performance may decline if the software is unavailable or malfunctioning; the failure to consider contextual factors, such as variations in patient demographics across different settings; the inability to account for uncertainty, particularly in categorizing input data that may be subject to inter-observer variability; and issues arising from the opacity of the algorithms. Grote and Berens (6) illustrate the dilemma by referencing a common scenario where two expert clinicians may disagree on a matter. While they can discuss the reasons for their differing opinions, the conversation becomes one-sided when a clinician and a machine are at odds.

The Rise of Virtual Health Assistants: The influence of artificial intelligence on the healthcare sector has been remarkable. Among the most significant developments is the introduction of virtual health assistants, which grant patients 24/7 access to essential healthcare information. These chatbots and voice-activated systems are capable of assisting with a variety of tasks, including appointment scheduling and responding to basic medical inquiries. By optimizing healthcare delivery and improving patient engagement, virtual health assistants are reshaping the administration of healthcare services. A machine-learning model can analyze the health patterns of countless patients, enabling it to assist physicians in predicting future events at a specialist level, utilizing data that extends beyond the individual doctor's clinical experience (Rajkomar, A., Dean, & Kohane, 2019). I firmly believe that this technology possesses significant potential to transform healthcare delivery in multiple ways, and I look forward to witnessing its ongoing advancement in the years ahead.

BENEFITS AND CHALLENGES OF AI INTEGRATION IN HEALTHCARE

The integration of artificial intelligence (AI) has transformed the healthcare sector by offering a range of advantages. A key benefit is the substantial enhancement of efficiency in medical operations, enabling healthcare providers to concentrate on more intricate cases. Moreover, AI's capacity for precise diagnosis and treatment significantly enhances patient outcomes. The technology also has the capability to process vast quantities of data, yielding valuable insights for medical professionals and researchers. However, the implementation of AI in

healthcare is not without its challenges. A primary concern is the protection of data privacy and security, as the sensitive nature of medical records means that any security breach could have dire repercussions. Additionally, there is the issue of biased AI algorithms, which may result in erroneous diagnoses and treatments. To mitigate this risk, it is essential that AI systems undergo thorough testing and evaluation to ensure they are devoid of bias.

Ethical considerations are crucial when integrating AI into healthcare. To foster trust among patients and healthcare professionals, the technology must operate transparently. This entails that AI systems should clarify their decision-making processes to confirm that they are making ethical choices. A significant aspect will involve determining how to ensure this transparency, which may include approaches such as regulatory frameworks, programming methodologies, collaborative task forces, or a combination of these strategies (N Engl J Med. 2018). Furthermore, AI must be deployed in a responsible and ethical manner, adhering to compliance standards to guarantee equitable healthcare outcomes for all patients. In conclusion, while AI holds the promise to transform healthcare, it is imperative that its implementation is conducted responsibly and ethically to fully harness its advantages.

The transformative potential of artificial intelligence in the healthcare sector is substantial. Its utilization in areas such as medical imaging, drug development, personalized treatment, virtual health assistants, and predictive analytics is poised to revolutionize patient care, enhance health outcomes, and lower healthcare expenses.

Nonetheless, it is crucial to tackle issues related to data privacy, bias, transparency, and ethical considerations to ensure the responsible deployment of AI technologies. Collaborative initiatives involving AI specialists, healthcare practitioners, policymakers, and patients will be essential for the effective integration of AI into healthcare systems, ultimately benefiting society and advancing medical practices.

AI's capacity to improve diagnostic precision and enable early disease detection could save numerous lives. Furthermore, AI-driven personalized medicine promises to enhance treatment effectiveness and tailor care to individual patients. The rise of virtual health assistants guarantees ongoing access to healthcare information, empowering patients while simplifying administrative processes for healthcare providers. Although the potential of AI in healthcare is clear, it is imperative to address ethical issues, data privacy, and regulatory compliance to ensure responsible use. It is essential to correct biased algorithms and unclear decision-making processes to uphold fairness and maintain patient trust.

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