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Examining the Impact and Challenges of Artificial Intelligence (AI) in Healthcare

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Artificial intelligence (AI) is revolutionizing the healthcare sector in various ways, from boosting diagnostic performance and patient management to speeding up clinical operations and lowering medical costs. Medical imaging analysis, medication discovery, patient monitoring, and patient communication and assistance are just a few of the uses for AI-powered solutions. The influence of AI in healthcare is broad, with the potential to change healthcare delivery. Implementing AI in healthcare would enhance patient outcomes, safety, and experience and empower healthcare organizations to function efficiently and effectively. Although there are some reservations regarding the ethical and privacy implications of artificial intelligence in healthcare, the benefits are evident as technology evolves and progresses. As artificial intelligence develops extensively and is incorporated into the healthcare business, we may expect to see even more significant and positive outcomes in the coming years. The purpose of this paper is to examine the effects of AI on healthcare and to investigate its potential benefits and challenges.

Introduction

Artificial intelligence (AI) is a rapidly evolving field with the potential to transform healthcare. AI is a subfield of computer science concerned with creating algorithms and computer systems capable of performing tasks that usually require human intelligence, such as pattern recognition, decision-making, and natural language processing. AI has made significant progress in healthcare in recent years and has been used in various applications ranging from medical imaging and diagnosis to drug discovery and patient care. This paper seeks to evaluate the influence of AI on the healthcare sector and to explore its opportunities and challenges.

1. Applications of AI in Medical Imaging and Computer-Aided Design

Medical imaging is an integral part of healthcare, and fast and precise diagnoses are essential for a positive health experience. Artificial intelligence (AI) has the potential to improve medical imaging and diagnostics by enabling quicker and more accurate diagnoses. The impact of artificial

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intelligence on medical imaging and diagnostics will be discussed in this section. The development of computer-aided detection (CAD) systems is one of the most profound impacts of AI in medical imaging. Algorithms are used in these systems to assess medical images and detect potential diseases or disorders. AI-powered CAD systems, for example, can be used to detect early indicators of breast cancer in mammograms or probable lung cancer in CT scans (Ganapathy et al., 2018).

CAD systems are trained using vast datasets of medical pictures and annotations, allowing them to learn to recognize patterns and anomalies that human radiologists may miss (Derevianko et al., 2023). This improves the accuracy and timeliness of the diagnosing process, resulting in better patient outcomes. CAD systems can also manage massive amounts of data, allowing them to evaluate images considerably faster than human radiologists, lowering the amount of time spent on image analysis.

In addition to CAD systems, AI is being utilized to automate the process of viewing and analyzing medical images, decreasing the need for human interpretation by radiologists. AI algorithms, for example, can be used to analyze MRI data and detect problems that human radiologists may overlook. The use of AI in medical imaging has the potential to greatly enhance diagnostic accuracy while also speeding up the procedure, resulting in better patient outcomes.

1.1. Challenges

While the influence of AI in medical imaging and diagnostics is significant, various obstacles must be examined. One of the major issues is the scarcity of big, high-quality medical picture and annotation datasets, which are required for training AI algorithms. Furthermore, the quality of the data used to train AI algorithms can affect their accuracy. Ensuring the accuracy and dependability of AI algorithms is critical for the effective use of AI in medical imaging and diagnosis.

The requirement for regulatory approval and uniformity is also another challenge experienced in this field. The use of AI in medical imaging and diagnostics is still in its early phases, and regulatory approval and standards are required to ensure its safety and efficacy.

1.2. Opportunities

AI has a big impact on medical imaging and diagnosis and has the potential to change the sector. AI-powered CAD systems and automated image interpretation can boost diagnostic accuracy and speed, resulting in better patient outcomes. However, several obstacles must be tackled, including the scarcity of high-quality data, the requirement for regulatory permission, and uniformity. Nonetheless, the potential benefits of artificial intelligence in medical imaging and diagnostics make it an attractive and promising area of research.

AI has the potential to have a substantial effect in two areas: drug discovery and personalized medicine. AI algorithms can be used to evaluate massive volumes of data to identify novel drug targets and personalize therapies for specific patients. In this section, we will examine how AI influences medication discovery and personalized medicine.

2. Applications of AI Drug Discovery and Personalized Medicine

Pharmacological discovery is a time-consuming and costly process that involves identifying new drug targets, generating new compounds, and verifying their efficacy and safety in clinical and preclinical studies. AI can transform drug research by enabling faster and more efficient target selection and drug optimization.

AI is used to process enormous volumes of data from multiple sources, such as genomics, proteomics, and metabolomics in drug discovery (Wang et al., 2022). AI algorithms can be utilized to find patterns and links in data that human researchers may miss, allowing for the identification of new drug discovery possibilities.

Furthermore, artificial intelligence systems can improve novel drugs by anticipating their attributes and potential toxicity (Ahuja, 2019). This can lower the time and expenses associated with the optimization process, allowing for the faster and more efficient creation of novel medications.

Personalized medicine is a healthcare method that develops individualized treatments based on a patient's unique characteristics, such as genetic profile, lifestyle, and medical history. By enabling the analysis of enormous volumes of data to find patient-specific variables that may influence treatment outcomes, AI has the potential to play a key role in personalized medicine.

The study of patient genomic data is one approach AI is being used in personalized medicine. AI algorithms can be employed to detect patterns and links in data that human researchers may not observe, allowing for the identification of genetic markers that may influence treatment outcomes (Lee & Yoon, 2021). This data can be utilized to create personalized treatments for specific patients, increasing their outcomes and lowering the likelihood of adverse events.

2.1. Challenges

While AI has tremendously impacted drug development and customized medicine, various issues need to be addressed. One of the most significant issues is the scarcity of high-quality data required for training AI algorithms. Furthermore, the data quality used to train AI algorithms can influence their accuracy (Chatterjee, 2020). Therefore, it is critical to ensure the accuracy and reliability of AI algorithms to deploy AI in drug development and customized medicine successfully.

Another hurdle to tackle is the requirement for regulatory approval and standards. The application of AI in drug development and personalized medicine is still in its early phases, and regulatory approval and standards are required to ensure the effectiveness and safety of AI algorithms.

2.2 Opportunities

AI has a substantial impact on drug discovery and personalized medicine, and it can potentially change the health profession. AI algorithms can be used to evaluate massive volumes of data to identify novel drug targets and personalize therapies for specific patients. However, various obstacles must be overcome, including the scarcity of high-quality data, the necessity for regulatory approval and standards, and ensuring the correctness and dependability of AI algorithms. Nonetheless, the potential benefits of artificial intelligence in drug discovery and customized medicine make it an attractive and promising area of research.

3. Impact of AI on Streamlined Clinical Workflow

The healthcare sector is confronted with various issues, such as an aging population, a shortage of healthcare personnel, and increasing expenditures. Artificial intelligence (AI) can combat these problems by optimizing clinical workflows, increasing efficiency, and decreasing errors. One of the primary ways AI can improve clinical productivity is by automating regular procedures. AI algorithms, for example, can automate appointment scheduling, record keeping, and data analysis, allowing healthcare practitioners to focus on patient care. This can dramatically enhance the speed and accuracy of patient information management, decreasing the likelihood of errors and improving patient satisfaction.

Another way AI can help healthcare practitioners is to provide real-time decision support. AI systems can evaluate massive quantities of patient data and give doctors real-time advice, allowing them to make more educated judgments (Saleh Ibrahim et al., 2022). This can enhance diagnosis speed and accuracy, shorten treatment time, and improve patient outcomes. AI can also aid in resource allocation by forecasting which patients will require the most, allowing healthcare companies to allocate their resources effectively. This has the potential to cut expenses, improve patient outcomes, and lower the chance of errors. The application of AI in optimizing clinical workflow is still in its early stages, but the potential benefits are evident. AI can potentially improve the quality of care and lower the cost of healthcare for patients by reducing errors, boosting efficiency, and freeing up time for healthcare workers so they may focus on important tasks.

4. Impact of AI on Remote Patient Monitoring

Remote patient monitoring (RPM) is a healthcare delivery approach in which healthcare workers use technology to monitor patients from a distance. AI in RPM has the potential to enhance patient outcomes, lower costs, and boost patient happiness. Improved patient monitoring is one of the primary advantages of AI in RPM. AI algorithms can remotely monitor patients, particularly those with chronic diseases, and send real-time information on their health status to healthcare providers (Gamble, 2020). This can enhance diagnosis speed and accuracy, and shorten treatment time.

AI can also assist with resource allocation by forecasting which patients will require the most significant resources, allowing healthcare companies to allocate their resources effectively. This has the potential to cut expenses, improve patient outcomes, and decrease the probability of errors. Improved patient involvement is another advantage of AI in RPM. AI algorithms can converse with patients, providing them with real-time information on their health state and assisting them in efficiently managing their ailments. This can boost patient happiness and decrease the likelihood of errors. AI in RPM is still in its early stages, but the potential benefits are obvious. AI can change healthcare delivery and improve patient care by enhancing patient monitoring, lowering costs, and increasing patient happiness.

In summary, AI has the potential to significantly impact the healthcare business, notably in the areas of simplified clinical workflow and remote patient monitoring. AI has the potential to improve patient care and save healthcare costs by reducing errors, increasing efficiency, and boosting patient happiness.

5. Impact of AI on AI-powered Chatbots for Patient Communication and Support

The healthcare industry is increasingly embracing AI technologies. The development of AI-powered chatbots for patient contact and care is one area where AI is having a significant impact. AI-powered chatbots are computer programs that model patient conversations using natural language processing (NLP). They can be used to answer common queries, schedule appointments, provide medicine reminders, and provide emotional support, among other things.

One of the key advantages of AI-powered chatbots is their accessibility. They are available 24 hours a day, seven days a week, allowing patients to acquire the information they require whenever they need it (Ragavi et al., 2021). This is especially beneficial for people with chronic illnesses who may have questions or concerns outside of usual office hours. Another benefit of AI-powered chatbots is their ability to provide personalized support. They can tailor their responses to individual patients, providing information that is tailored to their specific needs and interests. As a result, patients' engagement and satisfaction may improve as they feel more supported and understood.

Chatbots powered by artificial intelligence can potentially be utilized to improve patient education and self-management. Chatbots can empower patients to take a more active role in their healthcare by providing information about their illnesses and treatment. This can result in better outcomes and a higher quality of life. Another advantage of AI-powered chatbots is their capacity to minimize healthcare expenditures. Chatbots can free healthcare experts to focus on complicated cases by providing basic information and support. They can also eliminate the demand for in-person appointments and phone conversations, saving patients' and healthcare organizations time and resources (Zhang et al., 2021).

The ability of AI-powered chatbots to give accurate and reliable information is one possible worry. On the other hand, chatbots are growing more sophisticated in their capacity to understand and respond to patient questions and concerns as NLP and machine learning develop. They can also be designed to recognize when a topic or problem is outside their expertise and refer the patient to the proper healthcare practitioner. As a result, AI-powered chatbots can provide valuable data to healthcare businesses and increase patient interaction and assistance. Organizations can obtain insights into patient preferences and requirements, identify areas for improvement, and refine their patient communication strategy by evaluating patient interactions with chatbots.

Chatbots driven by AI can potentially transform patient communication and support in the healthcare industry. They can boost patient engagement and happiness, enable people to take a more active part in their healthcare, and decrease costs for healthcare organizations by offering individualized, 24/7 assistance. As technology advances, we can anticipate even more complex and effective chatbots in the future.

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