

Original Article

The AI Revolution in Healthcare Product Management

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Received: 11 December 2023

Revised: 18 January 2024

Accepted: 02 February 2024

Published: 13 February 2024

Abstract - Artificial Intelligence (AI) is revolutionizing several industries, including healthcare, with its rapid advancement (Lee and Yoon). Specifically, by improving patient care and results, AI can completely transform healthcare product management. This study examines how Artificial Intelligence (AI) is revolutionizing healthcare product management. It covers applications, advantages, difficulties, and potential future developments. Healthcare product managers can enhance patient experiences, expedite operations, make better decisions, and ultimately spur innovation in the sector by utilizing AI technology.

Keywords - Artificial Intelligence (AI), Healthcare, Product management.

1. Introduction

AI is a revolutionary new technology that has been developed in recent years and will be able to influence even the healthcare industry. With its goal to fill the gap concerning using AI-enabled innovations in improving health service delivery among patients, this research extends the potential use of facial recognition technology together with continuous brain activity monitoring. It can predict frequent moods during tasks in a week and thus forecast the emotions of an individual, making healthcare treated more from the patient's point of view (Adler et al., 2019).

Also, this approach shows that AI studying for deep learning can have such abilities to change the healthcare industry much. Further, AI could prove to be a crucial element in nanotechnology since it will provide design and programming of the robotic components that are so sensitive to such small-sized tumors – which would be other overhead risks for human intervention.

Furthermore, AI-based automation can help to provide quick medication dispenses easy, such as putting a simple injection that increases productivity and better care for the patients. The work presupposes that it is a new contribution to the research areas because of analyzing dual synergistic potentials between artificial Intelligence and healthcare technology. In contrast to prior research results, our method utilizes the computational force of AI. It comes with a new vision that helps tailor patient experiences while offering pivotal solutions for previously irresolvable healthcare challenges. In the rest of the sections, we will present a detailed discussion that is based on empirical data supporting further outline of practical features and the impact of how our work contributes to successive technological progress in healthcare.

1.1. Problems to be Resolved

One of the primary challenges in utilizing machines for medical care is their ability to interact effectively with young patients. While adults can comprehend and accept the presence of a robot caregiver, managing and treating children presents a unique difficulty. Although significant progress has been made in the field of artificial Intelligence, addressing this issue requires ongoing efforts from computer engineers and medical professionals. It is essential to emphasize that, no matter how advanced our computers become, the role of medical professionals in healthcare should never be overlooked. Machines can complement and enhance medical care, but they cannot entirely replace the expertise and compassion provided by human healthcare providers. Therefore, the goal is to find ways to improve the child-friendliness of machine-assisted medical care while recognizing the indispensable role of medical professionals in the healthcare ecosystem.

1.2. Research Gap

In the healthcare sector, human and machine collaboration has shown a possibility of forming a good partnership which would lead to higher quality of healthcare services. American Medical Association has presented a viewpoint that AI's role in the field of medicine is complementary, whereby it can only provide support to humans and not take their position (Xu., et al., 2020). This means that AI should act as a reliable companion to professionals in the field of health. In the pages of this article, we intend to provide meaningful suggestions and ideas to healthcare leaders on the way they can implement AI wholly and transform into a digital-driven era in healthcare. Artificial Intelligence is a broad category of tools and technologies such as robots, machine learning, data analysis, and others. These tools are slowly but surely making their way into the



healthcare industry, where AI has shown its ability to provide a powerful boost to the diagnosis and treatment of a host of diseases, even complex ones like cancer. In addition, AI can amplify the decision-making powers of healthcare practitioners and equip them with a clear understanding of the process of patient care. This is especially of great value to patients who may be immobilized or are not able to communicate as a result of injuries or neurological disorders. AI helps to reduce the gap so these people can communicate with their environment. Basically, AI and

human professionals are set to work together to ensure the healthcare sector reaches new levels of efficiency. The standpoint supported by the American Medical Association clarifies the concept that AI should not replace human wisdom but should function as an appreciable aid. In the course of this paper, we will explore applicable instructions for healthcare leaders on how to use AI, thus getting them ready to perform as a necessary component of the more digitally-based time in healthcare delivery.

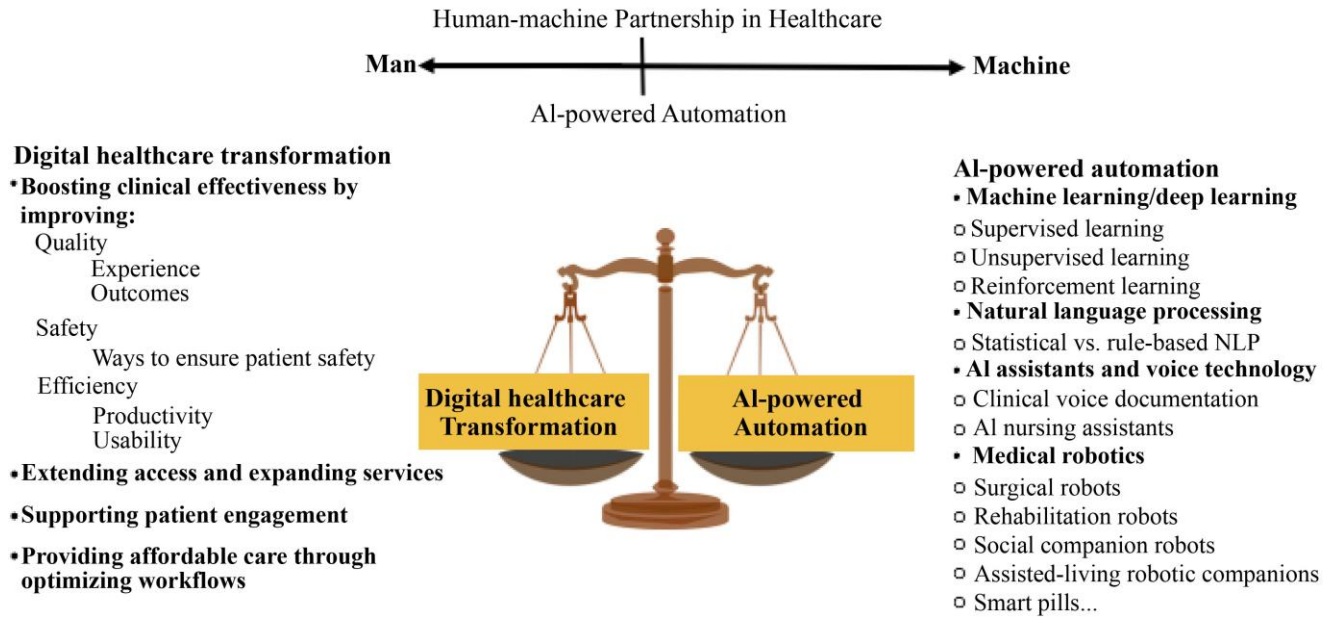


Fig. 1 shows the human machine partnership in healthcare

The diagram below is appealing in the fact that it explains how Digital Healthcare transformation is between human aspects and machine or AI-aided automation. The Man section, on the left side, enlists benefits and attainments that have been brought about by the digital transformation of healthcare into different factors, such as ensuring quality of healthcare has been enhanced through bettering patient experience outcomes, patient safety, efficiency, productivity and usability. It also seeks to promote availability and enhance customer engagement in their care, reducing the cost of care by ensuring workflow optimizations. This includes some sort of technology and method developed under AI, which is included on the right side ‘Machine’ These consist of methods based on supervised, unsupervised, and reinforcement learning machine learning techniques as well as natural language processing for the understanding and generation of human speech and AI assistants with voice control for tasks such as record documentation clinically. It also enumerates medical robots in surgery, rehabilitation, and as companions, along with intelligent pills—presumably formidable drug delivery systems. The center scales reflect the equilibrium that

is established from human and machine components as this healthcare transformation of the two weighs in toward optimizing care delivery and results. The arrow that moves from ‘Man’ to ‘Machine’ and vice versa in the Chapter 2 diagram zooms in on the explanation that there is a dynamic relationship between human health professionals and AI-technologies.

2. AI Applications in Healthcare Product Management

The developments in Generative AI, notably the ChatGPT, are groundbreaking events that brought a new phase of machine intelligence. This development has attracted a lot of attention from experts who are known for their understanding, but they view this technology as one that brings an inherent change (Bohr & Memarzadeh, 2020). Its capabilities are far-reaching in dealing beyond solving real practical problems confronting the world; it encompasses healthcare, among others. Solutions such as this are obviously fickle with all the wide implications they carry.

Global Artificial Intelligence in Healthcare Market, 2016-2026, (US\$ Mn)

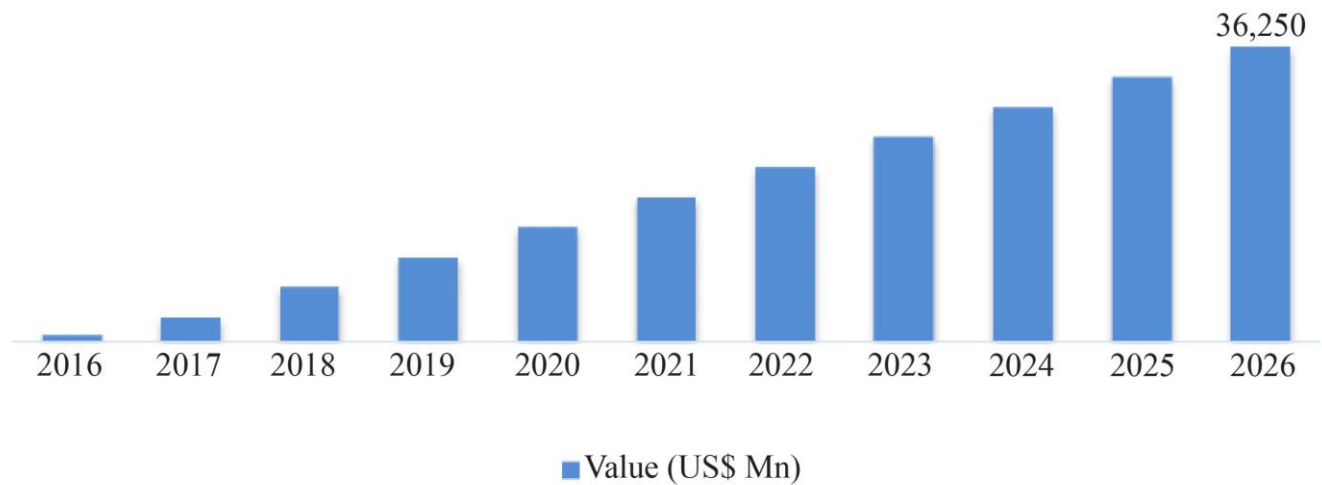


Fig. 2 shows the AI revolution in the health sector in previous years

2.1. Diagnosis and Imaging

Practically, automated diagnostic technologies imply remarkable advancement in disease diagnosis due to impressive improvements in image processing concerning both criteria: accuracy and speed. By incorporating machine learning algorithms in medical imaging systems, the process of creating leads to more efficient ruling out disease categories as well as efficacious treatment techniques. AI algorithms provide significant support for patient data, clinical guidelines and medical journal assessment, helping physicians to perform accurate diagnoses and leave from doubt in treatment consideration.

2.2. Predictive Analytics

Artificial intelligence systems pride themselves on their remarkable effectiveness in anticipating disease risk by utilizing data concerning patients. This makes it possible for healthcare providers to act proactively by shaping the interventions targeted at individual patients. Also, product managers can employ predictive analytics and minimize wastage during inventory management to make effective use of resources.

2.3. Drug Development and Development

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2.4. Personalized Medicine

AI facilitates the implementation of customized patient therapy programs that ensure the efficacy of treatment for all patients. Through data derived from AI-led technology, product managers in the healthcare industry utilize the information to provide targeted solutions to individual patients according to their needs. This analytics-based approach guarantees patients that they will get and are getting treatments and solutions that neatly fit their needs, possibly pointing to higher successful therapy outcomes and greater patient satisfaction (Vita, et al., 2019). The practical implications of AI use in this situation are innovative and have a lot of potential to transform healthcare provision and management of products.

3. Challenges in the Application of AI

3.1 Data Security and Privacy

Due to the use of highly sensitive patient data, it becomes critical in terms of privacy and security matters, which one should draw all the legitimate conclusions. Data security policies that are solid and strictly implemented must be instituted so as to protect patient information, which in turn ensures confidence between them and the healthcare institution. To make sure that the solution works, product managers must compromise different segments in order to achieve an optimal balance between effectiveness and safe use of AI technologies within healthcare. Through such efforts, they can establish trust and reliability among patients while demonstrating high levels of data protection and confidentiality that lay the ground for a sustainable integration

process with no concerns regarding AI involvement in medical practice.

3.2. Integration with Current Systems

However, the introduction of AI into the current healthcare system does lead to some challenges about automation compatibility and interoperability. The need for AI consideration calls forth these issues, which require well-thought consideration and preventive management so that inclusive implementation of AI technologies facilitates a harmless and efficient adoption (Lee & Yoon, 2021). Here, the key position of product managers is revealed as they control the smooth functioning of Acs in the healthcare environment. They play a crucial role in guiding the implementation of AI technologies to ensure successful integration of systems implemented as it will be done in a way that allows for seamless coordination between these complex systems without any disruption and distortion, which shall ensure smooth running performance as well as increased system efficiency. Well, most effective product managers take a proactive stance on facing these challenges, and that is how they help achieve successful adoption of AI in the healthcare industry, benefiting both patients and providers alike.

3.3. Ethical Considerations

The application of AI in healthcare raises one a lot of important problems, such as responsibility and demographic biases. Innovative methods must be used to reactively overcome these challenges because the responsibilities of AI deployment within various healthcare settings should be addressed overall. Product management can contribute greatly towards balancing these ethical concerns, responsible for designing and overseeing AI systems that are built upon a framework of fairness, transparency as well as accountability. By proactively responding to these concerns, product managers help make AI technology ethical and responsible in the field of healthcare, thus boosting trust among patients that they are being served well.

4. Challenges and Considerations

Integration of AI into healthcare product management is an undertaking that consists of a range of challenges as well as concerns that should be addressed. These additionally include, but are not limited to, technical elements besides ethical, legal, and organizational issues.

The median role of patient information in AI-driven healthcare products has caused much apprehension about security, privacy and the moral code. A vital security feature that needs to be in place is that patient information, which is deemed to be private, should be maintained at all costs to ensure that trust is established and preserved in the healthcare industry. Strengthened security measures and ethical frameworks are required to ensure that applications of artificial Intelligence fulfill the paramount requirements of privacy protection and protection of patient data. The product

managers have to actively develop strategies that follow these same values rather than adding to anxieties and uncertainties for patients as well as their healthcare professionals.

4.1. Regulatory Compliance

The sheer landscape of regulations and compliance dictates that careful navigation of these obstacles is necessary for the implementation of AI into the realm of product management within healthcare. Since patient data is used in the application of AI, there is a need to strictly adhere to legal frameworks for patient safety, integrity of information that protects the well-being of the patients, and, finally, use ethical practices in applying artificial Intelligence. The product managers become vital for discreet compliance as they help in establishing that the AI solutions are compliant with regulatory standards so as to foster responsible and lawful AI deployment.

4.2. Fairness and Bias

Ethical AI also becomes necessary due to the need for fairness and demarginalization of bias in technology. Reasonable guidelines are needed to restrict the usage of AI systems in a way that results in discriminatory outcomes and inviable access shapes of healthcare. These issues address the need for constant evaluation, fine-tuning and openness in the usage and behavior of AI algorithms and decision-making procedures. Product managers need to ensure that the fairness and bias mitigation strategies in the medical AI systems are factored accordingly, which will allow those solutions to be ethical, unbiased outcomes.

4.3. Integration and Use

While introducing AI into healthcare product management is possible, it requires notwithstanding competing organizational and technical challenges. This includes incorporating AI effectively for existing processes and environments, which is crucial for acceptability by a large number of people. We can say that product managers actively participate in these actions, within the horizon of which ensures a simple transformation towards employment of AI health treatments that practically improve the status of all the system cases. The importance of their role in integrating technologies and guaranteeing UI fit the need for AI in introducing products to healthcare businesses cannot be underestimated.

5. Methodology

AI techniques include a wide range of variations, such as rule-based systems that are built on symbolic representations and work on inferences. An ANN-based system is used in AI systems to work on the interface with other neurons and connection weights. Despite this, they all have four things in common. For starters, they have the capability of knowledge representation. Artificial neural networks use connections and connection weights, whereas rule-based systems, frame-based systems, and semantic networks use a set of if-then rules.

Second, systems with AI capabilities can acquire new knowledge. They collect data as self-learning entities, for example, by determining the rules for a rule-based expert system or selecting the proper connection weights for an artificial neural network. Thirdly, they possess the rules that an AI system may have, either explicit or implicit. There are other ways to integrate the search function into the system, making it the fourth one (Kocarnik et al., 2022). By minimizing the fitness function, it can be used, for example, to identify the states that lead to a solution faster or to determine the ideal choice of connection weights for an ANN. AI can alternatively be classified as “rule-based,” often referred to as AI, and “non-rule-based,” or ML, depending on the method used.

For example, when the case is stated as “when subject numbers of two different datasets are the same, they should be treated as duplicates and need to be merged,” the algorithm would perfectly follow the instruction and merge the numbers. When there are few possibilities, a rule-based system works well. However, developing a rule-based system in complicated settings is difficult. ML, on the other hand, creates rules directly from known training input and uses statistical approaches to execute them in ML algorithms. Thus, machine learning focuses on swiftly recognizing patterns in massive amounts of data to produce discoveries that are more trustworthy than manual analysis and forecasts. AI has now entered the biological field, proving its worth through novel and cutting-edge techniques. Furthermore, in recent years, the world has witnessed a true revolution in the field of information technology (IT), resulting in the production and storage of massive amounts of data, not only in the sphere of technology but also in other sectors. During the last half-century, both information technology and biology have thrived. Moore’s law states that the number of transistors on a chip will double every two years. It is both a result of and a driver of the rapid rise of information technology.

6. Literature Review

In this section, we are going to dive deep into what the conclusions of studies and opinions by experts on the use of Artificial Intelligence (AI) in healthcare. We will go through various fields, such as the positive aspects of AI technology and its ability to be helpful in low-resource areas with less human capital available, while discussing both how it was used during COVID-19. We shall also visit the arena through which AI is transforming surgery. By undertaking this literature review, we will be able to have a glimpse of what has been achieved so far in this discipline. It feels like taking a journey through what others have already discovered about AI applications in therapy, which should help us comprehend the options and threats of deploying such systems.

6.1. Artificial Intelligence’s Potential in Healthcare

According to the study conducted by Davenport and Kalakota, healthcare is not an exception to the rule that computers are capable of completing a wide range of tasks

with occasionally more accuracy and precision than humans. AI, including machine learning, is used in healthcare for a wide range of jobs. These duties range from administrative, such as keeping track of and updating patient files and records, to diagnoses, which may be completed with as much or even more accuracy than a human, to even performing precision surgery.

Even though they are utilized in the healthcare sector virtually exclusively, there are occasionally a few problems with them. Complex systems like these are difficult to update and manage because of the massive amount of medical knowledge and data that is always being added. Accuracy in identifying these systems is another problem. For instance, an AI can identify whether a person has cancer or not, but it cannot identify the specific type of disease. Statistical analysis techniques can be used to overcome these issues, but doing so opens the door to the “Medical Ethics” dilemma. Human interaction is another concern regarding machines in healthcare.

To begin with, AI is a relatively new concept, and fully applying it in the healthcare sector will take some time and effort. Diagnostic AI can currently just read graphs and statistics. Human expertise is still essential. As a result, it is extremely unlikely that AI will disrupt human workflow. Instead, machines will need more human companions to learn about and develop for the healthcare sector, creating additional job possibilities. Patients’ main concerns about using an AI doctor are privacy and openness.

For this reason, laws and stringent regulations about the improper use of these devices and identity theft should be put in place by the government in relation to voice and facial recognition. Maintaining and updating these devices and systems has become increasingly challenging due to the rapid advancements in medical understanding. Tech firms are working with healthcare networks to leverage AI to analyze massive amounts of data and produce more precise forecasts (Kocarnik et al.). In conclusion, automation and artificial intelligence have the potential to transform the healthcare industry completely, but there will undoubtedly be many challenges along the way that we will soon overcome.

6.2. Healthcare Using Artificial Intelligence in Underdeveloped Countries

AI represents a new dawn, according to Vita et al. However, the measures and arrangements that an emerging nation such as India ought to undertake are equally crucial. AI is frequently employed in radiology in the healthcare industry to identify, diagnose, categorize, and assess the risk of breast cancer. It is also used to diagnose lung nodule disorders and stroke and to quantify and grade the degree of osteoarthritis in the knee. Aside from that, AI can boost output and better healthcare outcomes by maintaining organization and cleanliness.

The Watson for Oncology (WFO) is a computer system that analyzes data to make therapy recommendations, from already existing medical information. It also contains therapy procedures and patient charts. Because the medical workforce is in limited supply, particularly in India, AI can help to meet that demand by completing duties such as image analysis and diagnoses, which will then alert professional physicians for prescriptions and treatments (Davenport & Kalakota, 2019). It should be recognized that the opportunities AI will create, such as the ever-expanding scope of data science, will be studied by many bright engineers in the country.

Furthermore, educational institutions are providing students with early exposure to the enormous prospects and sectors of interest in AI. In conclusion, Artificial Intelligence (AI) is a vast resource. India is lagging in harnessing its potential, which will not only expose India to AI but also assist in the healthcare industry as well as many other disciplines, and, thanks to its AI resource, can help India become the dominant force in the world.

6.3. AI in Healthcare during COVID-19 Pandemic

AI has been shown in earlier research by Efthymiou (Xu et al.) to help track and forecast the COVID-19 virus's transmission by monitoring social media, media outlets, and real-time data. By integrating and utilizing this data, it is possible to forecast future hotspots and the trajectory of the virus's transmission. These methods may also prove beneficial in averting and forecasting future pandemics. One of the components of Artificial Intelligence (AI) that is utilized to replicate a biological network for improved comprehension and analysis in the fields of dermatology, radiology, etc., is the Artificial Neural Network (ANN).

With the use of technology, like smartwatches and smart clothes, it can gather data and keep an eye on patients. Artificial Intelligence can support the management of patients without placing an excessive amount of strain on medical staff, and it can also be reasonably priced for the patients. Patients can be taught the steps and practices involved in administering injections and taking medications by using chatbots and other internet resources.

However, issues like any mistake in the AI system can put a person's privacy at risk, and a lot of researchers think the AI can figure out how to accomplish a goal without using the planned path, which could hurt the user inadvertently (Bohr and Memarzadeh).

Thus, reconsideration and double-checking of existing information, as well as planning for future use, are critical. However, this strategy would be difficult to implement and will necessitate a significant amount of work from data scientists and medical practitioners. Thus, AI can be very valuable in healthcare and with recent happenings, but there are still certain concerns and problems to be overcome.

6.4. Artificial Intelligence in the provision of healthcare

According to a study published by Bouskill et al. (2018), paper claims that artificial Intelligence can offer healthcare delivery with precision on par with or superior to that of a human. AI in healthcare has several important applications, including patient monitoring and support. AI technology has the potential to be used to continuously monitor patients. Everything can be continuously monitored, including heart rate, electromyography, ultrasounds, and sleep patterns. Apart from that, it's also fairly typical to use virtual assistants to find out about a patient's health and condition.

The rise of AI has aided in administrative aspects of healthcare, such as preserving biometric records, filling out prescriptions, and so on. Appointments are made. Robots are commonly used to care for elderly patients, who are especially vulnerable because they are sometimes left alone in hospitals without sufficient assistance. Robots can meet this requirement while also guiding them through unexpected environments. Overall, it can be stated that AI can give healthcare to those in need with great accuracy.

6.5. Artificial Intelligence in Surgery

With its subfields, Artificial Intelligence is opening new possibilities in surgery while supporting doctors in important surgeries. Robotics and machine learning are being used. Pathologists, surgeons, and radiologists employ artificial Intelligence to reduce errors in diagnosing cancer-positive lymph nodes, performing lumpectomies, and making intraoperative judgments. Data such as blood pressure, temperature, glucose, weight, and meals can be tracked by mobile sensors and uploaded into a patient's EMR before surgery. Considering the various subfields of AI and their contributions to medical surgery, as well as their limitations.

7. Limitations

Traditional methodologies can surpass AI in many circumstances. AI analysis may contain flaws due to systematic biases and faulty assumptions input. In a few cases, the risk exists due to AI's lack of interpretability since it cannot yet discern causal links in data and hand in automated clinical analysis.

7.1. Context-Specific Performance

There are cases where the old-fashioned modes of rectifying will deliver more than AI algorithms. In different environments, AI might be inefficient, and even though it will reach the level of human skills, in certain aspects, its performance could still lag behind that of a professional.

7.2. Systematic Biases

This, in turn, causes AI systems to be inclined towards such biases that are present on the surface of the data with which they were trained. This kind of bias has the potential to produce inaccurate or inconsistent results, especially when AI is developed for such a sensitive area as the healthcare sector. Due to this, it is a constant challenge to address such biases.

7.3. Erroneous Assumptions

AI models are based upon input data and assumptions; therefore, misconceptions or false weeds within information may become flaws of the analysis by using artificial intelligence techniques. Making sure that the input data are as accurate and reliable can make a differential in trustworthy AI results.

7.4. Interpretability Challenges

Though inability of AI to interpret itself may persist as a challenging problem that needs to be addressed more precisely. The most distinct barrier influencing the approach toward AI is understanding how this algorithm arrives at its decisions, even more so in complicated clinical scenarios. This non-transparency can impede the trust and confidence in medical professionals to even deal with insights produced by artificial Intelligence.

7.5. Ethical Dilemmas

If applied in the medical field, AI could give rise to ethical conundrums, such as when it concerns the confidentiality of patients and security data. The debate will continue to balance what the medical system attains from AI-driven healthcare vs. patient information protection continues.

7.6. Continuous Updates and Maintenance

Medical knowledge rapid advancement is a major challenge to keeping up on what new stage of artificial encephalization is waiting for you and then implementing the new stuff. For that reason, continuous updates and maintenance give the relevance of artificial intellect in medical care which is inevitable.

7.7. Human-AI Collaboration

However, the establishment of integration and smooth interaction between medical staff and AI systems is a process

that needs some scientist's knowledge to train them for practicing when an emergency occurs. Yet keeping AI up one's expertise but does not taking its place is an ingredient in the application of this technology that calls for institutional coordination. Finally, while AI has a chance to be an agent of tremendous changes in healthcare by offering unlimited opportunities for clinicians and patients alike, advancement is not only about overcoming stated limitations but also developing solutions that make it possible to downwatch these obstacles.

8. Conclusion

As such, the merging of AI with healthcare product management sets an unprecedented platform for healthcare systems to engage in revolutionary changes in patient care and decrease the chances of failure. If healthcare product managers are ready to accept all the AI technology in its entirety then there is an abundance of opportunities that will open in front of them. These potential include improved patient outcomes, redesigned operational efficiency, streamlined decision-making processes and subsequent innovations in healthcare. The transformation of the healthcare industry driven by AI technology leaves nobody indifferent. Nevertheless, it is important to remember that this path is not simple but is the road we must tread. Problems in regard to the privacy of data, compliance with regulation, bias minimization and acceptance of AI as a widespread phenomenon have to be considered carefully. These are critical to unlocking the full potential of AI in healthcare product management standards organized along ethical, moral, and responsible practices. The path forward undoubtedly will be fraught with complexity. However, the journey is to be traveled across a striated landscape strewn with possibilities for change that answers worldwide needs in healthcare.

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