

SECTION: MEDICAL SCIENCES.

SEKCJA: NAUKI MEDYCZNE.

How to cite: Bashkirova, L., Kyrychenko, N., & Koval, H. (2024). The Role of the Digital Metaverse in Shaping AI, Medical Training, and Holistic Health: A Scoping Review. *International Conference on Science, Innovations and Global Solutions*. (pp. 578-582). Futurity Research Publishing. <https://futuraity-publishing.com/international-conference-on-science-innovations-and-global-solutions-archive/>

The Role of the Digital Metaverse in Shaping AI, Medical Training, and Holistic Health: A Scoping Review

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Accepted: July 25, 2024 | **Published:** July 31, 2024 | **Language:** English

Abstract: The use of artificial intelligence in medicine involves applying machine learning models to search, analyze, and extract information from medical data. The role of the digital metaverse, which is gaining prominence in shaping artificial intelligence, is evaluated. Key trends and approaches to using the metaverse are analyzed, with a focus on its potential for innovation in AI, healthcare, and the implementation of virtual environments for students. Special attention is given to the challenges of

integrating the metaverse. The introduction of meta-technologies in healthcare and education, and their impact on the effectiveness of treatment and communication with patients, is described.

Keywords: virtual reality, medical simulations, interactive training, digital avatars, AI integration in healthcare.

Introduction

The rapid development of artificial intelligence is gradually changing medicine as such, revealing its advantages in diagnosing, treating, and preventing diseases. The market for AI solutions in medicine is growing every year. Currently, healthcare is one of the largest areas of AI implementation. Medical images and scans are becoming one of the most popular areas of AI, as the interpretation of CT, MRI, and X-ray scans is essential for the correct diagnosis and further treatment. Artificial intelligence already can analyze images much better than humans (Ammendola, 2024). AI data analysis allows the timely detection of cancerous tumours and the diagnosis of tuberculosis, pneumonia, osteoporosis, and nervous diseases. AI algorithms can analyze a patient's medical record, medical history, genetic information, and living conditions and can predict possible health deviations.

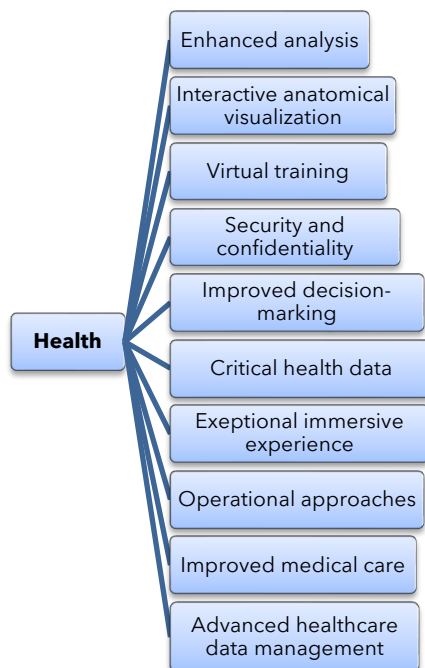
Artificial intelligence allows for the processing of a huge amount of data in just a few seconds, which becomes helpful in clinical and experimental trials in the treatment of diseases and the creation of new effective drugs, which accelerates the development of medicine for years and therefore, patients will receive their treatment faster (Barta, 2024). Antibiotic resistance is a problem for humanity, but AI is already solving this issue. AI generates the possibility of the danger and spread of new viruses to avoid pandemics (Bazargani, 2024). The use of metaverse and AI in student education is a very big advantage. Technology allows students to operate, conduct experiments, and treat virtual classroom patients. Today, medical institutions can use immersive technologies, such as virtual reality (VR), in practical classes. This technology contributes to a better mastery of the class topic and prepares future specialists for real clinical cases that may occur during surgery or during the treatment of a patient, and with the help of virtual reality glasses, the human brain perceives the image as real. Future doctors can study the structure of human organs in 3D projection and see their functions (Cerasa, 2024). Classes using 3D technologies help not only to make courses exciting and informative but also to help students decide on their future speciality. In recent years, developments in computing and virtual reality technologies have made modern medicine difficult to imagine without them.

Research Results

The development of the metaverse opens a new perspective and ways to improve artificial intelligence. The metaverse is a virtual space where everyone can learn and collaborate with each other in real time (Figure 1). The metaverse continues to be introduced into the educational and medical sphere, opening up new opportunities for applying knowledge in practice and improving patient treatment and diagnosis (Chen, 2024).

Figure 1

The application of metaverse in healthcare

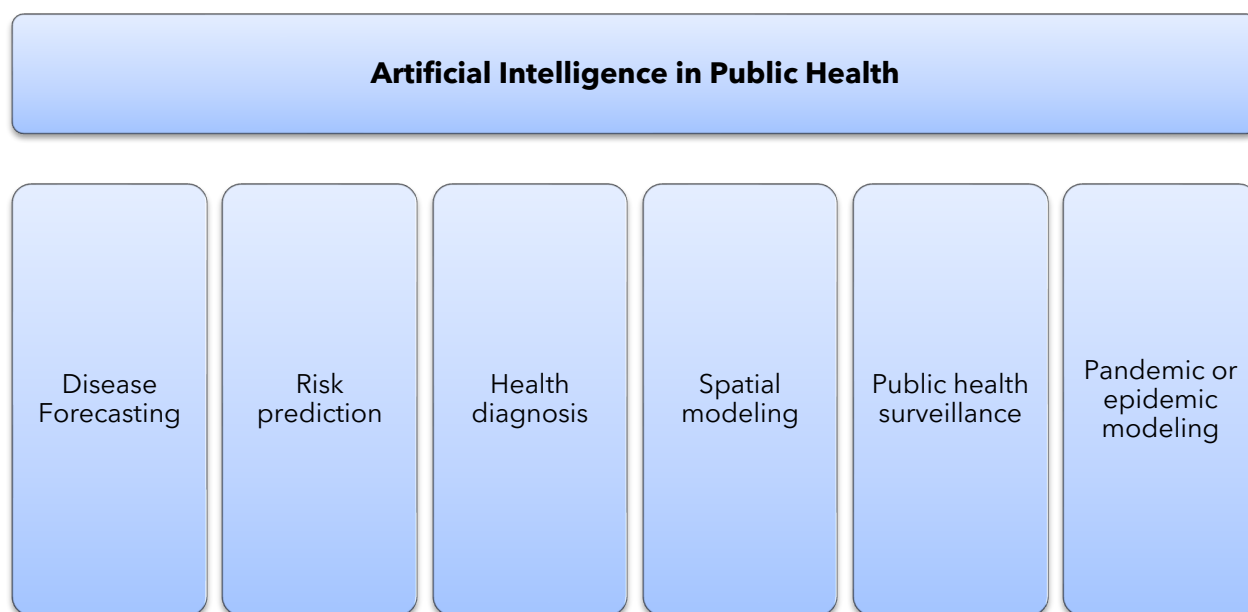


Source: authors' own development

Our research is based on analysing literature sources on the PubMed website for the last five years. We established that artificial intelligence began in 1950 and made an invaluable breakthrough in science and medicine. AI applies complex machine learning algorithms to process a huge amount of data, learn and create a certain useful result (Flavián, 2024). AI systems can save time for doctors to write notes, enter patient data, decipher research results, remotely diagnose and treat patients, answer patients' questions and send them the necessary information (Figure 2).

Figure 2

The role of Artificial Intelligence in Public Health



Source: authors' own development

However, AI systems could be more perfect in terms of empathy. Often, the patient wants to see the doctor's sympathy for his condition or, on the contrary, the doctor's smile, his support (Kim, 2024). This can lead to the patient's mistrust of the attending physician. Replacing chatbots with digital avatars in VR can be useful in the AI-based metaverse. Such chatbots become excellent assistants in the treatment of patients at a distance. Patients will be able to perceive him as a friend, and the main thing is to see the doctor's emotions and compassion (Luo, 2024). Augmented reality technology is increasingly gaining popularity in medical universities. First, this is studying the human structure, conducting dangerous experiments, and treating a virtual patient. This is a great help in training good specialists and also saves time: it is better to see the structure of an organ in 3D than just a picture in a book (Pantano, 2024). The application of VR technologies has been extensively researched in nursing and has shown excellent results in teaching clinical skills (Wang, 2024). Augmented reality technologies have gained particular popularity in surgical practice. Practising skills and precise, correct movements are all necessary for surgeons. Young specialists can improve their movements without risk to the patient. Also, thanks to the metaverse, you can demonstrate your skills from anywhere in the world (Zaidi, 2024). Research has found that the metaverse can improve mental health precisely by creating environments that help reduce stress and anxiety.

Conclusions

Metaverse has a wide range of healthcare applications that combine AI with augmented and virtual reality. It can significantly improve the process of treating patients and training young doctors. As telemedicine continues to improve, the metaverse is expanding its capabilities to serve patients better. Metaverse significantly expands the circle of communication, allows you to receive qualification assistance from anywhere worldwide, and gives education seekers access to various educational platforms. However, despite certain shortcomings of the metaverse, it is increasingly becoming a part of education and health care. However, more is needed to diminish the importance of the metaverse as a tool for improving AI, education, and holistic health. The digital metaverse has every chance to become a powerful leap for the further development of medicine and the treatment of people.

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