

# METaverse AND ITS FUTURISTIC APPLICATION IN HEALTHCARE

*Future of Healthcare*

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**Abstract:** Humans are one of the most precious creations of nature; with each passing decade or century, we are coming up with different innovations to improve our life experience. After we got hit with the COVID-19 pandemic, we realized that we need and can access daily necessities from the comfort of our homes. One of the essential requirements for any person of any age or race or any part of society is healthcare. Receiving quality healthcare from the comfort of one's home became necessary for every person during a pandemic. Machine Learning and Artificial Intelligence have already been used and researched to get better-quality Healthcare. Artificial intelligence (AI) has been used in multiple fields in the healthcare industry; one of the uses was the designation of early, rapid, and accurate breast tumors [1][2]. To improve the quality-of-life futurists and technologists are already exploring how Metaverse can play a crucial role in different aspects of our daily life [3]. This commentary explores how Metaverse can improve our experience with healthcare.

**Index Terms** - Metaverse, Artificial Intelligence, Machine Learning, Healthcare, Web 3.0

## I. INTRODUCTION

Metaverse originated in 1992 in the science fiction novel Snow Crash by author Neal Stephenson; it combines the word 'meta' with the universe [4]. The story defines the Metaverse as a virtual environment parallel to the physical world. Metaverse is what is perceived as the next level of the internet. The term metaverse became a household word when Mark Zuckerberg named his organization "Facebook" "Meta". But the history of Metaverse dates back decades (Figure 1)

Metaverse can be described as a virtual environment blending the physical and digital worlds, where users can interact using digital avatars [6]. It can be explained as combining the Internet, Web 3.0, and Extended Reality (XR). XR is created by different degrees of Augmented Reality (AR) and Virtual reality (VR) [6]. We can take the example of the movie "Free Guy." In the film, the characters who play video games wear Sunglass that acts as an in-game augmented reality glass where they can see scores, power-ups, etc. The players using the sunglass lens can experience the Free City's Metaverse.

### *Covid-19 Outbreak and Digital Transformation*

The Covid-19 outbreak changed the way we do social interactions. We started engaging with friends and family more digitally than ever. Online shopping, workouts, etc., have become a thing, and we have become more dependent on the digital world. With the outbreak of the Covid-19 pandemic, we understand that the straightforward healthcare system has limitations. We need healthcare service from the comfort of our living room, and the adoption of telemedicine and our appetite for remote care has increased. Many wanted to see the potential for telehealth version 2.0 and how the doctor-patient experience can be taken to another level with AR and VR.



Figure 1: This figure shows that Metaverse is not a recently coined term, although it is still grasping the internet world; the 3D immersive internet started in 1938. We have a way to go, but we seem to be on the right trajectory [5]

Currently, different healthcare applications provide telehealth, but we need to schedule calls and discuss fundamental questions with our healthcare providers. For example, to get any x-rays or check on a tumor, we still need to visit our hospitals or healthcare centers. Sometimes, people saw their healthcare centers and got affected by COVID and lost life. The thought of more digitalizing of healthcare came to my mind when in 2021, I was about to have my baby. I could always use telehealth for essential checkups; even hospital apps were available for billing purposes or to keep doctor records. However, for ultrasound or to monitor the baby's growth, I still had to visit the hospital, which made me feel uncomfortable since we were still struggling with the pandemic.

## II. ARTIFICIAL INTELLIGENCE IN HEALTHCARE

With each passing era, digital healthcare is becoming a priority. The World Economic Forum [7] already predicted that digital services would be one of the most crucial moves in transforming our healthcare system over the next decade. We can already see the contribution of Artificial Intelligence (AI) and Machine Learning (ML) in healthcare and how it is evolving. In a study of AI and ML methods for breast cancer [2], we can see a detailed explanation of how AI helps healthcare providers by providing correct classification, enhanced analysis, and quicker results. AI in healthcare offers multiple benefits, including automating tasks and analyzing patient datasets to deliver healthcare better, faster, and at a lower cost. According to Insider Intelligence, 30% of healthcare costs are related to administrative tasks. With Artificial Intelligence already paving a solid path and co-relation with the healthcare system, we can only imagine how Metaverse can improve the experience to another dimension.

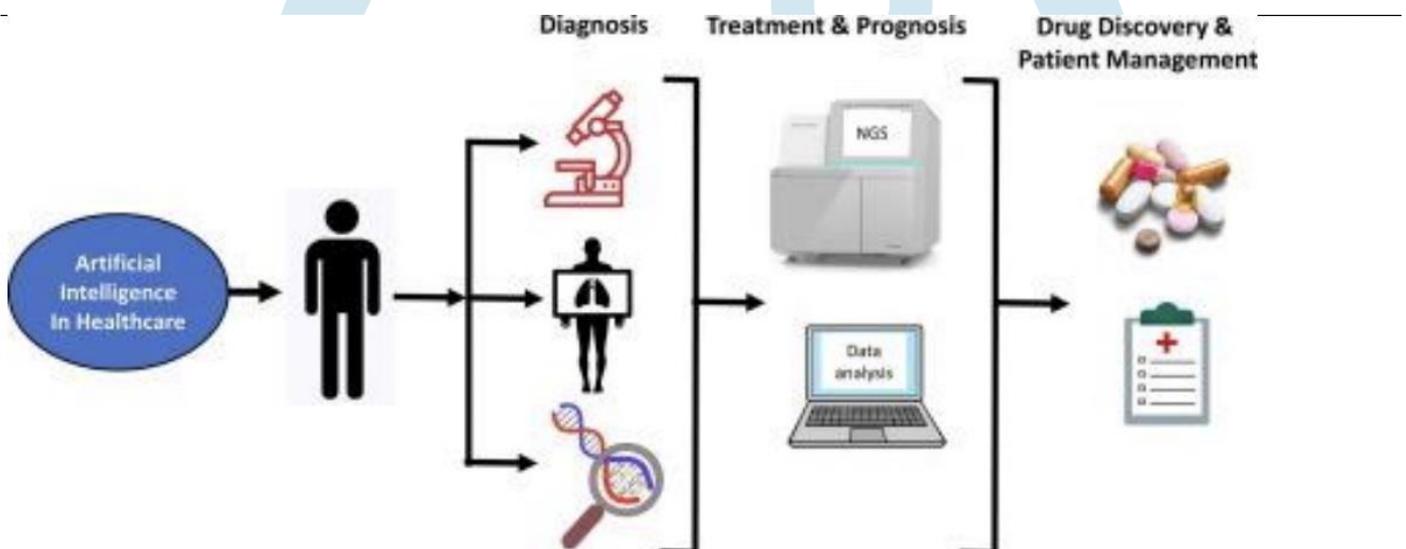


Figure 2: Artificial Intelligence in Healthcare [7]

## III. METAVERSE AND HEALTHCARE

Among different metaverse technologies, AR and VR technologies are more promising. In 2025, the global AR and VR market will be near about 85 billion USD, and for healthcare, that can be around 5.1 billion USD [8,9,10]. AR and VR are already being used in the gaming industry and are expected to be a vital part of healthcare.

John Hopkins University succeeded in the world's first surgery using Xvision, an AR-based spinal surgery system. This has obtained FDA approval and has been used since 2020. VR is already used for rehabilitation, mental illness, or any other training required for patient treatment.[10]

These technologies can redesign and reimagine the doctor-patient experience fully. Combining these new build technologies will provide healthcare professionals with highly integrated and individualized care in place of the current siloed nature of existing healthcare. Metaverse, as mentioned, is a convergence of three powerful technologies that all potentially impact healthcare. Before 2020, studies found that only 43% of healthcare facilities could provide remote treatment, but today the figure stands at 95%. For essential routine consultation, visiting a doctor's office is no longer mandatory, but with Metaverse, another dimension of possibilities will open up. Anyone who has used headset-based VR has conveyed another sense of experience far better and life-like compared to websites, social media, or messaging applications.

Many healthcare centers and hospitals are already using Metaverse to train their professional staff and medical students. Doctors use it to practice in a virtual world before surgery. Imagine using a VR glass and sitting in your comfort space if a whole-body scan

can be done and Metaverse is already part of the extended version of the blockchain, which helps save transactional data. There are a few examples of metaverse technology that is bringing healthcare to individual doorsteps in healthcare.

South Korea's healthcare system is removing the physical barrier with the rise of the Metaverse. A local startup, Looxid Labs, has developed a medical assessment and training system that uses AI and VR technologies to detect early signs of dementia and Alzheimer's disease. The company uses a VR sensory headset to play cognitive games. The headset can measure the patient's working memory, attention level, and spatial perception by reviewing their behavioral and neurophysiological response.

Tetra Signum developed a non-face-to-face educational, medical examination platform that improved the virtual education platform service with surgical education content. It offers CPR education using AI and VR technologies with its device called Meta CPR 1.0. According to the company, the program can increase the effectiveness of CPR lessons.[10]

Newbase, a company specializing in the development of medical Metaverse, has created a program to offer training opportunities that feel more real.

Thumbay Group, a UAE-based hospital, is planning to open the world's first metaverse hospital, where the patients will use their metaverse avatar to consult with doctors. They are also utilizing VR and AR to help patients who have been bedridden for more than six months.[11]

Surgical mind provides medical training services using human body models and VR technology instead of actual patients.[10]

<i>Provider Focused</i>	<i>Realistic Medical Training</i>	<i>Metaverse simulations will accurately help to simulate environmental factors for medical issues.</i>
<i>Patient Care</i>	<i>Mental health/ Telehealth</i>	<ol style="list-style-type: none"> <li>1. We have multiple examples of healthcare systems using Metaverse for mental health. It can help diagnose patients' cognitive and behavioral conditions quickly.</li> <li>2. We already have telehealth tools existing with Metaverse added. We can jump into more detailed healthcare diagnoses in a virtual world.</li> </ol>
<i>Assisting Patients</i>	<i>Reduce admin work</i>	<ol style="list-style-type: none"> <li>1. Easy saving of patient data, with Web 3 allowing users to own their data.</li> <li>2. The nurses or doctors do not have to spend hours on paperwork; all the data will be saved by itself.</li> <li>3. It will reduce patient and hospital costs. Training new doctor is a costly process. Using cadavers and another real recourse is expensive and limited; instead, using a human like the model in Metaverse is less costly.</li> </ol>

Figure 3: Different ways the healthcare system can interact with Metaverse

There is a plethora of educational applications of Metaverse, which includes different problem-based virtual learning environments.

#### IV METAVERSE AND PATIENT SAFETY

There are privacy and security concerns with Metaverse. Zuckerberg of "Meta" acknowledges that the self-explanatory part of the security concerns is people might get impersonated. There are chances of account hijacking, bots, and also age verification. A necessity if including biometric or facial recognition might be required. We need to ensure the confidential information of patients is safe and secure. HIPAA guidelines have evolved with the arrival of telehealth [12]. Once there is more extensive adoption of Metaverse, the guidelines and policies will be updated to address another set of concerns [12]. Although there are privacy and security concerns around Metaverse, doctors are all set to leverage technological advancement for improved healthcare because Web 3.0, the foundation for the Metaverse, is based on blockchain technology. It will include decentralized applications that support a decentralized crypto economy.[13]

## V CONCLUSION

This study explores the significant effect the Metaverse can bring on healthcare and how it can be leveraged to improve the healthcare experience of patients, doctors, and nurses. The metaverse civilization is progressing fast, but we must look for a holistic approach to see how this digital world will reach many parts where stable internet is still tricky. Many areas exist to explore for further study. One of them will be to explore options. Metaverse can create a virtual space similar to reality to predict treatment and get prescribed medicines,

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