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# Artificial Intelligence And The Metaverse: Present And Future Aspects

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Abstract- The two most vital twenty first century technologies are Artificial Intelligence (AI) and the metaverse. Both can enrich people's lives in many ways, advance many industries, and improve the efficiency of numerous working processes. The metaverse encompasses all these realities; virtual, augmented, and physical. Though the term "metaverse" has been around a while, it remains an emerging technology, even as it becomes one of the hottest topics of conversation in an ever-growing presence. It will not be long until the metaverse will be a place to work, learn, shop, be entertained, and connect to others in ways we never believed could be done. Most metaverse experiences will not be possible without machine learning, which is a branch of AI that allows software applications to make more accurate predictions with outcomes, but not explicitly programmed charges. AI and data science will continue to lead this convergence of technology to revolutionize how people connect and interact globally. will yield innovations, revenue streams, and deeper connections. Al and the metaverse can be utilized in a number of industries including healthcare, gaming, management, marketing, education, and so forth. Generally, these technologies are examined independently without consideration of how each influence one another and are possible collaborators. This paper examines how artificial intelligence and metaverse work together, and their application in a number of industry, as well as their influence. Before the role AI plays in the metaverse can be described the concept of the metaverse should be described, where and how it is applied, and its possibilities.

Keywords- Artificial intelligence · Metaverse · Web3 · Virtual reality Machine learning.

## I. INTRODUCTION

Al applications are already far more common than most people realize. In recent survey work by McKinsey, they found that 50% of the respondents said their organizations used AI for at least one business function, and in a Deloitte report over 40% of enterprises said they had an AI strategy that covers their organization [1].

And consumer-facing applications do also play an important role by leveraging AI technologies such as facial recognition, natural language processing

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(NLP), faster computers, and all sorts of methods working below the surface. AI naturally has the potential to parse enormous amounts of data at superhuman levels of speed to extract insight and catalyze action. In the context of augmented and virtual reality, users can use AI to augment their decision-making process (which covers a majority of applications in the enterprise context), or start to couple AI with automation for entirely low-touch processes. All of this speaks to the metaverse, or future of MarComms, which will combine augmented reality (AR), virtual reality (VR), artificial intelligence and blockchain to create both scalable and accurate virtual worlds.

The metaverse is poised to be the next major innovation in the evolution of the Internet [2], with limitless possibilities to redefine how we live our real lives, transact, learn, and even leverage government services. However, the conception of the metaverse as a functional—albeit virtual—reality requires large steps forward in a variety of technologies that provide the foundations of the metaverse. In some cases, these necessary innovations are already in development. For example, in January 2022 Meta launched an AI supercomputer, boasting numerous applications which include ultrafast gaming, instant, accurate and simultaneous translation of large amounts of text, images and video [3].

The supercomputer is intended to both develop new Al models and facilitate the foundation for future metaverse technologies. In certain instances, these fundamental advancements are already being researched. For example, Meta launched an Al supercomputer in January 2022, which has a considerable range of expected applications from ultrafast gaming and immediate, credible and synchronous translation of large amounts of information that includes text, photos and videos [3]. The computer will be a pivotal component in the advancement of the next generation AI models and will serve as the foundation for future metaverse technologies. In general, consumer tools such as virtual reality (VR) headsets or smart glasses have yet to capture or convey the full metaverse experience, although they exist in the market today. Any new devices intended for use in the metaverse must be

designed to create a frictionless experience for the user. Also, another Meta innovation, is the haptic glove, which is intended to allow the user to touch and feel virtual objects in the metaverse [1, 3]. The Metaverse is one of the most important emergent technologies at the moment.

In fact, the Metaverse is creating such a commotion in the virtual world that Facebook, the social media giant, even officially changed its name to Meta to represent the importance of the new universe. Al is likely to play an important role in enabling the inclusivity and accessibility of the Metaverse, making it more useful and usable [4]. These technologies are positioning itself to change the internet, and business as we know it.

### II. Literature Survey

The first occurrence of the concept dates back to 1992, when Neal Stephenson brought together the words meta and universe in his science fiction book Snowcrash [5]. In the book, the metaverse was described as a reality where people enter with special goggles, and then correspond with the other people in this "virtual world". To understand the metaverse, we first have to understand artificial intelligence (AI). Al is the act of programming a computer to make it a decision maker. There are many ways to accomplish this, with machine learning being the most common of the two [6, 7].

Machine learning (ML) is a type of AI that allows a machine to learn from data without being told exactly what to do [8–11]. It operates through a process of trial and error, and ultimately finds patterns in the data it receives. Deep learning is a more advanced type of machine learning, that uses artificial neural networks to learn from data. Neural networks are inspired by how the human brain works, and can learn tasks such as image recognition and natural language processing.

### The Metaverse Versus VR

A lot of people think of metaverse and VR as interchangeable terms; however, these two concepts are not very alike at all. VR which is short for Virtual Reality, definitions a simulated experience that

people get by utilizing specific VR headsets. writer Matthew Ball: The next generation of the Experiences in the VR world can imitate the outside real world, such as meeting friends, going to the cinema, playing a computer game, etc., or completely remove people from the real world by immersing them in a new fictional and fantasy world. The term metaverse refers to a hypothetical future representation of the internet that includes and is built upon virtual reality, virtual worlds, and augmented reality.

The metaverse is really not there today; however, the metaverse will allow people to communicate, buy, sell, play, learn, work, and much more in a centralized virtual experience. [12]. To be more precise, in the real-world metaverse describes a futuristic version of the internet that people will reach via a VR headset, augmented reality and other everyday devices (mobile phones and PCs or laptops). The difference between this and what we currently refer to as web2, is incredibly vast.

Even the possible decentralized web3, where information is still accessed through websites and applications, or social media based messengers or meeting services like Zoom, Microsoft Teams or Discord, stands apart from the concept of the metaverse. The metaverse describes an immersive virtual environment where a user is represented by a custom avatar, and gains access to information by means of all the technology like VR, AR, etc [12].

Perhaps the metaverse isn't here yet, but some of its artifacts do presently exist in other ways. Some companies like Epic, for instance, have already begun to refer to some of their products. as metaverses. For example, the battle royal game Fortnite is typically considered a metaverse as the users can interact via virtual avatars and the game showcases various events with the help of VR technology.

### Metaverse and Web3

A recent definition of the Metaverse, released by Coinbase, uses a version from venture capitalist and internet: A massively scaled, persistent, interactive, and interoperable real-time platform consisting of interconnected virtual worlds where people can socialize, work, transact, play, and create [13]. The Metaverse is the ultimate evolution of Web3.

Ultimately, it will be a complex of decentralized, interconnected virtual worlds with a functioning economy and people can do all things they do in their everyday life. There has been much discussion around the internet and what its future will look like, but as Coinbase, points out in its article it is to important to differentiate the Metaverse from the Web3 [14].

Chris defines Web3 as building advanced digital services that will be built by the community for the community instead of being built for the community by massive technology companies like Web2, embracing the ethos of Web1 where users at the edge of a network created value primarily in a writemode. For a platform to be defined as a Metaverse using Coinbase's definition, it must include: 1. Virtual Worlds 2. Massive Scalability 3. Persistency 4.

Always on & Synchronicity 5. A platform to build on 6. A fully functioning economy 7. Openness and decentralization 8. Interoperability. One other perspective of the Metaverse is - the article from Jon Radoff [15], which presents the value chain of the Metaverse under CC BY, as shown in Fig. 1. Jon defines the Metaverse as "the real-time, activitybased Internet." He also identifies that the Web3 is what does enable value-exchange between applications in this new Internet that the Metaverse is [15, 16].



## The Seven Layers of the Metaverse

Figure. The seven layers of the metaverse [15]

### Al in the Metaverse

There can be some moments in which AI can play a relevant role in the future of the metaverse, both from a product perspective but also considering how AI can potentially make the Metaverse more inclusive. The layer schema that Jon [15] has in his paper, is shown in Fig. 2

## III. The Key Promises of the Metaverse

There is a framework for the metaverse that is relying upon a set of promises or capabilities that this technology will soon be able to offer. The four core promises are a decentralized world, verification of identity, smart contracts, and ETPs. In order to explore where AI fits in the mix of the promises of the metaverse, let us specify each promise [1].

The first promise of a decentralized world is what the metaverse purports to give us. This is very much like web3 in that users will be in control of their own data, their own digital assets, and their own identity stored

on a distributed ledger, inherently secure and tamperproof. Under this promise, there cannot be a repeat of the status quo of web2 where a few centralized tech companies wield power over other users. This promise enables all users who are engaging with the internet.

The next promise relates to verification of identity. In this situation, the metaverse uses blockchain to verify the identities of users. If a user is preverified, the blockchain will ensure that only someone with that user's verified identity can sign or create a digital immutable.

Data can now be accessed by users who have passed authorization. Some significant technological leaders advocate for the metaverse to embrace selfsovereign identities (SSI). SSI are digital identities that relate to verification and authorization data used in the real-world (Example: biometrics) and utilized in a decentralized manner.



Al potential applications in the Metaverse

Figure. 2 AI potential applications in the Metaverse, based on "Building the Metaverse" by Jon Radoff, under CC BY license

Another aspect of the promise of metaverse is smart contracts. Smart contracts are used to automate and secure transactions. To put this technology in proper context, smart contracts are essentially computer programs, or transaction protocols, that can automatically record, control, or execute a transaction in a very predictable and conditioned manner based on the terms of a signed agreement or contract.

Therefore, there is an expectation that the metaverse would have this functionality to transact various activities (trading) in accordance with predetermined agreements. Lastly, but most certainly not least, exchange traded products (ETPs) will be incorporated into the metaverse technology. This is quite a simple goal to understand: the metaverse will have its own cryptocurrency to use for buying-selling and to fund AI applications for completing tasks. Now that we have an understanding of what the objectives are for metaverse systems, we can begin to consider the working partnership between AI and the metaverse. So, let us explain how artificial

intelligence can assist humanity in getting closer to building it.

### How AI and the Metaverse Collaborate

Chatbots are among the best uses of AI that streamline many processes in business and help users resolve their issues much faster. Also, this method of communication will be used in the Metaverse. Aside from their functions of customer service, marketing, sales, etc., chatbots can also help users in the Metaverse by providing instructions and information regarding different products or services, answering user questions, processing transactions for users, taking orders, etc.

For example, if a user is searching for a certain good and they cannot find it, the chatbot could easily alleviate the problem by directing the customer to that location within the Metaverse [17, 18]. For additional information regarding chatbots, see these AITJ articles: "Virtual Moron-Idiot!": Why Chatbots Fail and the #ChatbotRescue Mission Saving Them and Customer Service 2.0: The Rise of Chatbots and RPA. Also, you can learn more about the top

chatbots here Best AI-Powered Chatbots [5]. Furthermore, artificial intelligence can be used to develop accessible interfaces that make users' journeys easier for everybody, including people with disabilities. Therefore, AI can help the Metaverse be a user-friendly and easy platform. The use of technology, such as Natural Language Processing (NLP), speech recognition, computer vision, translation, and augmented reality will allow users to communicate with the Metaverse in their native language and through images and videos and improve user interactions with the Metaverse [19]. Digital avatars are yet another means in which AI can engage with the Meta-verse.

For example, AI can use NLP, virtual reality, and computer vision to generate realistic avatars to represent users, create environments, develop dialogues, and produce images. In sum, while AI can connect with the Metaverse in the form of digital avatars, chatbots, interfaces, etc., it is not yet here, and on the other hand, artificial intelligence may well advance even further by the time the next generation of the Internet is in place, creating even greater opportunities for collaboration for these technologies.

#### **Metaverse Versus Multiverse**

Both the metaverse and multiverse refer to virtual environments where people can interact with digital avatars and generates objects in 3D metabolic spaces. To compare, the metaverse is an entirety of common shared space that one can do all digital actions and share different activities with others. In contrast, the multiverse is a collection of various worlds. Metaverse activities could include playing video games, purchase virtual real estate, shopping for real virtual, attending lectures, or concerts, 3D virtual video conferences, and so on, while one could view multiverse as a platform that has more limited options to engage.

And interact within a single digital space for one particular function that the venue was designed for, offering an environment to play a certain game or engage in an exercise [3]. As noted above, while the metaverse is not new, we are not entirely there yet.

The metaverse is still developing and continuously looking for a future state full of possibilities, some even refer to it as "the new internet." Rather, we are presently living in a world of multiverses, each with its own attributes and functional integrations, all at varying levels of development.

For example, Facebook has one of the most widely recognized social media platforms and is now developing a platform centered on virtual and augmented reality. LinkedIn is another obvious example. Several multiverse platforms will converge as we continue to develop, coming closer to the "new internet." It will be at this convergence where AI and data science will be pivotal in taking us to a new phase in the advancement of human rights [20].

# The Role of AI and Data Science in Shaping the Metaverse.

The key thing to remember about AI and data science is the ability to sift through immense amounts of data in real-time to produce useful information and insights. Moreover, if done correctly, accurate interpretations will prompt immediate action, interactions, responses, and low-touch automated processing.

It will also include, among other things, event correlation, anomaly detection and determining causation, thus aiding in unifying and connecting other platforms. Virtual reality in the metaverse must be somewhat true to physical reality--the closer you are to physical reality, the more realistic the experience will be for the user. Al is the one and only tool that can accomplish this and would be impossible to accomplish by humans at scale. The range of possibilities for Al and data science in the metaverse is limitless.

Here are but a few:

- 1. Three-dimensional imagery
- 2. Animated content
- 3. Speech technology
- Natural Language Processing (NLP), such as realtime sentiment analysis, emotional analysis, text classification.
- Translation features
- 4. Design & artistic content

- 5. Blockchain technology
- Smart contracts
- Decentralized ledgers
- All types of transactions, including cryptocurrency.

### **Business Applications of the Metaverse**

AlOps. Al Operations or AlOps is a domain of Al that utilizes machine learning to enable businesses to better manage IT infrastructure. AlOps can be used to anticipate and prevent outages, to identify issues in the moment, or even to maximize usage of resources. The metaverse's framework needs to be highly resilient, it needs to be always on, and it needs to be scalable; these requirements put a significant strain on IT resources. For context, if an organization has a surge of metaverse usage, AlOps can quickly identify the situation and respond to any issues before they escalate [1]. Al bots.

Al bots for business use are growing in popularity. Al bots in the metaverse can assist in numerous business functions, including customer service, marketing and sales. Al bots in the metaverse can assist the users by providing instructions, information for products and services, answer customer queries, accept orders, even conduct transactions on behalf of users. To help visualize this, consider a scenario where a customer asks a chatbot where they can find a product the bot will be able to point the customer to the correct location within the metaverse.

The platform will also have to be accessible for all users to be used inclusively. Inclusive user interfaces must be present throughout the Metaverse platform, like an accessible user interface for people with disabilities. Al for accessibility will help create user interfaces that will be accessible for every user making the metaverse platform more user-friendly. Al technologies can be used for accessibility purposes such as: 1.

Speech recognition to transcribe user speech into text and natural language processing to interpret user intent 2. Computer vision to enable users to interact with the metaverse using images and videos 3. Translating what the user is saying or writing so

they can interact with the metaverse in their native language 4. Augmented reality to enable users to layer digital information on the physical world [19]. For instance, a user with visual impairment may be able to leverage computer vision technology to be able to see the metaverse in a richer sense or a user with hearing impairment may be able to engage with others through speech recognition based communication methods.

Digital Avatars. In the metaverse, users will interact with each other via digital avatars. Users will utilize these avatars as representation when in the metaverse and as such, will need to be lifelike and look realistic. Artificial Intelligence can assist in creating a lifelike avatar by using: 1. Computer vision will create realistic images of users 2. Natural language processing will create realistic conversation for the avatars 3. Virtual reality will create lifelike environments for avatars.

For example, a user may be able to build an avatar that looks like themself or alternatively, choose from an array of avatars. In addition, the avatars may communicate with each other creating lifelike conversation. This, then, would add to a more social experience for users within the metaverse. Digital twins. A digital twin is the virtual representation of a physical object. They can be used to visualize the status and performance of the physical object, and even project their future state. In the metaverse, digital twins will represent objects in the virtual environment. Al can support the creation of realistic digital twins by: 1.

Using computer vision to model physical objects 2. Using deep learning to realistically texture digital twins 3. Using virtual reality to add realistic environments to digital twins. For example, a company could create a digital twin of their factory in the metaverse. The digital twin could track the factory's performance and even predict future problems. It could also assist with physical world issues by having a virtual representation of the factory to assist with troubleshooting. New digital products and services: Businesses can also use the metaverse space to create and sell new digital products and services. Such as:

- 1. Virtual reality experiences
- 2. Augmented reality experiences
- 3. Digital goods and services
- 4. Entertainment content. Al can help businesses produce these new products and services by:
- Analyzing customer metadata to find out what customers want and need.
- Producing prototypes of new products and services
- Creating realistic simulations of new products and services.
- Testing products and services when they are developed. These may improve customers' experiences, reduce the cost of customer acquisition, or gain new revenue streams, gain loyalty from customers, and gain competitive advantage. For example, a business may create a virtual reality experience of a vehicle customers can explore fully, or homes customers can explore fully. This will help customers understand the product better and may stimulate sales. Remote working and collaboration. The metaverse will mean teams of people can work together and collaborate no matter where in the world they are located. AI can help remote working and collaboration by:
- Allowing real time translation of text and audio
- Allowing users to share documents, and files in the metaverse
- mmersive and realistic meeting spaces and office environments
- Virtual meeting aids such as whiteboards and video conferencing tools

As an example, the team will work together on a project from different places, using the metaverse. They can chat back to forth, share documents and files in real time, collaborate on projects. It will improve communication, and collaboration among team members.

### AI Use Cases in the Metaverse

While VR worlds can exist in and of themselves without artificial intelligence, pairing AI with VR worlds allows an entirely different level of realism to be achieved. The following five use cases may well benefit from this heightened realism [1]. Accurate

User Avatar Creation. The primary users in the metaverse are users, formerly known as players, and the accuracy of a user's avatar greatly affects their experience and the experience of other participants. Al engines are able analyze a user's 2D image or 3D scans in order to create a highly realistic simulated version of the user.

Al can also map different emotional expressions, facial features depending on aging, hairstyles, facial expressions etc... to allow us to develop very dynamic avatars and user representation. Already companies like Ready Player Me are using Al to create virtual representations of users. assist building avatars for the Metaverse, and Meta is building their own version of this tech [1, 20]. Digital Humans. Digital Humans are 3D representations of chatbots existing in the Metaverse.

They aren't actually representations of another person, they are much more like AI-powered nonplayer characters (NPCs) a video game would have that can react and respond to a person's actions in a virtual reality (VR) environment. Digital humans are constructed using AI technologies and represent one of the critical aspects of the Metaverse spectrum. From NPCs in games, automated assistants in workplace VR, and other implementations there are so many potential use cases, companies like Unreal Engine and Soul Machines have already started pouring investment into this direction [20].

Multilingual Accessibility. One of the main ways to use AI is for languages processing. For example, the digital human takes a natural language, such as English, and breaks it down into machine readible instructions through natural language processing, conducts an analysis of the language, forms a response, translates it back into English and returns to the user.

This process happens in milliseconds—just like a real conversation. The beauty of it all is that the response could be translated into any language depending on the training of the AI so the metaverse can be available to users from around the world [1, 20]. VR World Expansion at Scale. In this instance, AI is where the real power starts to happen. When you program

an AI engine with a historical data set, it learns from the previous outputs, and seeks to develop its own.

The outputs of any AI will continue to improve with every subsequent iteration. New input, as well as human feedback, will provide each iteration of the AI engine with reinforcement learning as well. Eventually, it will perform the task and offer outputs nearly indistinguishable from that of humans. Companies such as NVIDIA are in the process of training AI to create entire virtual worlds. This development will be a game changer for the scalability of the metaverse, as it relates to the point where companies can add additional worlds with no manual input. Natural interfacing.

As a final point, AI provides help with humancomputer interaction (HCI). Once one places an advanced, AI-enabled, VR headset on, the sensors can read and predict one's electrical and muscular patterns to know not only how he wants to move about inside the metaverse, but also what inputs will be necessary for certain movements of virtual objects. AI can even recreate a more realistic tactile experience in VR. AI can assist one in voice-enabled navigation so that one can interact with virtual objects without needing to use hand controllers.

# Artificial Itelligence for the Extraordinary Digital World.

The important aspects that this platform offers are the ability to establish virtual worlds, and replicate real worlds. Each of which is remarkable in the vast world buildina and simulation of diaital environments for testing autonomous robots, roles for Artificial Intelligence enabled voice technologies. NVIDIA technologies are the best example of the conjuring of virtual spaces by merging their AI with metaverse to create social exchanges. We have bridged the gap from virtual and physical life, opening up a new realm for creators and marketers to tap into, and experiment with. The market has a tremendous demand for remarkable experiences that can offer valuable information coupled with real emotional responses. These two key elements are called immersive. media and voice effectively provides an entry point into the ecosystem by responding to demand and offering new and

meaningful experiences [21]. With Covid-19, disgruntled parents paying for a "Zoom" education, and new worlds of virtual reality, digital twin campuses have become quite desirable. Stanford has offered a VR anatomy class and Arizona State has announced their intent to develop a similar offering.

## IV. Enhanced smart contracts.

The metaverse AI will come up with a platform that enables the exchange of digital assets and entitlements for the users. This will allow the protection of ownership and no interference from the big tech companies. Now, the bigger question is, will this be possible? The answer to this question can be stated as under; For instance, a huge brand called "Adidas" has of lately launched its first-ever NFT. However, the purchases were restricted to 2 people. What happened later on was that the sale was sold out in less than a second. The result was only one person was able to buy 330 commodities in a solo transaction. Now, this, in some way, is called the future of internet democratization.

It is clear that the power will be taken from the corporation houses, but the pertinent question is whether the power is in the hands of the people or not. The chances are a little dicey but in case it does, then a limited section of people will be able to access it. It is because there will be limited people who must have such high-level skills to retrieve benefits.

This kind of configuration will be configured with smarter smart contracts, layered with Al. In respect to this, the AlOps part possesses infrastructure details of the transactions that help to investigate the "anti-democratic activities". Even so, the blockchain transactions cannot be undone after they occur. Education and training. The metaverse will be a great educational and training tool. Al will help the metaverse become more effective for education and training by:

- 1. Letting users learn in immersive virtual environments
- 2. Offering virtual teaching assistants
- 3. Providing classes in a virtual space. For example, a person may be able to learn how to drive a car

in a safe virtual environment. They could take driving lessons, they could practice driving in different conditions, and they could crash the car without killing anyone. This would allow a person to learn to drive more quickly and safely.

## V. Challenges And Future Scope

At this juncture, the metaverse is heavily reliant on VR (Virtual Reality), AR (Augmented Reality) and MR (Mixed Reality) technologies and devices. As most of these technologies are not lightweight, portable, or cost-effective, the metaverse cannot reach mass adoption potential. On top of hardware access, we also have the challenge of ensuring that we have high-quality high-performance models that will allow for the right retina display and pixel density for a realistic virtual immersion [22].

### **Challenges Around AI in the Metaverse**

- It is important to remember that the metaverse is a new area of research and operation, and the implementation of the AI could run into something illustrative. For instance, there could be questions about.
- Ownership of AI Generated works idea; who holds the copyright to and can profit from the AI-generated content and VR worlds?
- Deepfakes and user awareness; how do we make sure users know they are interacting with AI and not another human? How do we prevent deep fakes and fraud?
- Fair use of AI and ML; can users use AI/ML technologies for metaverse interactions in a legal sense? e.g. can they use AI code to win a game?
- Right of use of data for AI model training; how do we ethically train and personally develop AI technology for the metaverse? What are the consent mechanisms?
- Responsibility for AI bias; if a digital human or similar AI algorithm is biased, what is the recourse?

In the end, it will be impossible to have an engaging, authentic, and scalable metaverse experience; we need AI. This is the reason that organizations such as Meta are collaborating with think tanks and ethics

organizations to minimize AI's risks without limiting innovation.

### **Challenges to Mainstreaming the Metaverse**

Naturally, widespread use of the metaverse is dependent upon a good user experience. Obviously the user of the metaverse or any multiverse requires a big headset, multiple controllers, and high-speed connections, which can be somewhat expensive. But the user experience is gaining traction daily and the shift to the metaverse requires more desired features and greater amounts of content, which will create more and more user demand, just like smartphones about a decade ago [23]. Another issue is that the user's expectations may be a little bit tougher at first.

However, the AI that is emerging, should lead to a future that allows for an easier user experience to access and experience the metaverse. At this point, there are many AI & data science uses to access and define the metaverse, which includes changing the online experience for the user. As the metaverse matures, there are going to be even more extensive uses for education, data science, and AI. Certainly, the future will contain uses that we may have difficulty imagining at this point in time. IntellectData TM builds and deploys software, software components, and software as a service (SaaS) for enterprise, desktop, web, mobile, cloud, IoT, wearables, and AR/VR environments [21].

## VI. Conclusion and Future Trends

The metaverse is a platform that has the power to change the world. It is a platform in which users can interact with each other in a virtual world, and it has the potential to change the way we work, learn, and play. AI will enable the metaverse to fulfill its potential by generating realistic avatars, creating new digital products and services, and facilitating remote work and collaboration. Organizations should be viewing the metaverse as a platform for innovation and creativity and leverage AI to create new products and services to improve purpose, boost customer experience, and gain a competitive advantage.

The metaverse is a virtual world that could change how we live our lives. It could change how we work, and AI could help form this reality. Experts believe the metaverse will be based on seven essential technologies: 5G communications, extended reality, brain-computer interfaces, cloud computing, blockchain, digital twins, and artificial intelligence. Arguably, of these emerging technologies, AI could be the greatest piece of the metaverse puzzle given its ability to allow for the metaverse to scale.

It is anticipated that most human interactions will be powered automatically by deep learning-based software, with chatbots and various forms of natural language processing (NLP) technologies offering support on all forms of interaction in this new space of extended reality; the machines operating within the metaverse will come to understand user inputs, text, images and video, because we can expect them to be programmed to reply correctly even if users use other input languages. However, huge amounts of data will be necessary, and the process of developing training such advanced NLP models is expected to span several years. In terms of metaverse development, AI is not only a required technology regarding computer vision and natural language processing; So far, it is also an emerging visualization tool, that allows designers create enhanced functionality.

Also in virtual and augmented reality (AR). For instance, with AR, AI has been employed in camera calibration, detection, tracking, camera pose estimation, immersive rendering, real-world object detection, virtual object detection, and 3D object reconstruction, all of which can ensure the diversity and functionality of AR applications. In the long term, AI may be at the heart of the vast majority of 3D images and animations, and speech for the "metaverse." Machine learning models may impact how smart contracts would be automated and provide support for other blockchain technologies that could facilitate virtual transactions. AI technology is also likely to support growth in the metaverse with object detection; enhanced rendering; and reducing and monitoring cybersickness. Arguably, while these advancements promise remarkable opportunities, the metaverse

has several issues to address, including security vulnerabilities and online abuse that remain a significant challenge. Overall, AI could be one of the technologies that help the metaverse overcome those challenges.

Attend the ITU's fourth academic conference to learn how current research is bringing the metaverse to life: The Ghana-India Kofi Annan Centre of Excellence in ICT will host Kaleidoscope 2022: Extended Reality-How to boost quality of experience and interoperability from December 7-9 in Accra, Ghana. Machine learning has made tremendous strides, and its growth is predicted to continue at an exponential rate. Artificial intelligence combined with the metaverse has the potential to create science fiction. In addition to socialising, people would be able to trade NFTs and other cryptocurrencies there. There is only one issue that needs to be addressed: having too many platforms can confuse users. To make the upgrade process more human-like, much-needed time and space should be allocated.

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