



The Metaverse: A Brave New “World”

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Abstract

As we stand on the precipice of the next significant socio-technological revolution, the Metaverse promises to transform our lives as profoundly as the internet did, if not more. The Metaverse is evolving as an immersive, collaborative, and interactive digital space, offering early glimpses of its vast potential. The scope of this digital universe extends far beyond just entertainment and gaming—it provides innovative ways to revolutionize education, business, healthcare, and finance, including burgeoning areas like cryptocurrencies. However, without establishing appropriate safeguards, the Metaverse also poses considerable challenges. The pervasive risks to privacy, security, and safety of individuals in an environment where redress mechanisms are yet undefined, are areas of concern that need urgent attention. This article defines the Metaverse, its evolution, potential benefits, and potentially harmful impact due to data privacy. Subsequently, it shares the results of a bibliographic study demonstrating that the Metaverse is becoming popular along with ethics and AI. Next, it presents the results from a global survey which suggests that the Metaverse implies cautiously optimistic tones. Moreover, the article introduces an AI-based new technology as an example between today's and tomorrow's worlds. Based on the results, it concludes why it is important to establish educational programs and guidelines for applying the technologies in the Metaverse. Finally, it makes recommendations for new research and other actions for the entire Metaverse ecosystem.

Keywords: Metaverse, Ethics, Digital anthropology, AI, Artificial intelligence, AR, VR

Cite this paper (APA)

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1. INTRODUCTION

The Internet has transformed our world, reaching into sectors such as business, education, government, healthcare, and communication, effecting changes unlike any other technology in history. As an essential part of daily life, the Internet's influence has blended online and offline activities to indistinguishability. The advent of the World Wide Web democratized internet access, and now millions worldwide use it for various purposes such as gathering information, accessing services, communicating, and entertainment.

The Internet's evolution has been characterized by the shift from Web 1.0, a platform for accessing and reading information, to Web 2.0, which fostered user interaction and collaboration. Today, we're witnessing the dawn of Web 3.0, marked by a transition from a network structure to a database model, incorporating elements of artificial intelligence (AI), 3D web design, and more. A key concept within the framework of Web 3.0 is the Metaverse. This idea seeks to blend physical and digital realities using cutting-edge technologies like augmented reality (AR), virtual reality (VR), 5G, edge and cloud computing, blockchain, AI, and non-fungible tokens (NFT).

The Metaverse, still an evolving concept, has found applications like Geppetto, with over 200 million subscribers, and Animal Crossing, which has even hosted virtual election campaigns. Along with others like Roblox, these platforms highlight the shift in social values of the younger generations, who treat their online personas as tangible as their offline identities. As such, the Metaverse requires a contemporary definition that accounts for this evolution.

This paper explores in detail the extensive implications of this shift towards the Metaverse. While recognizing the potential benefits, our focus leans more towards the unexpected challenges, particularly those related to privacy and data protection that could lead to user profiling and a permanent erosion of privacy. We will delve into the dichotomy of innovations and potential pitfalls within the Metaverse, contrasting the present state and future potentials of the technology within this sphere.

The exploration entails a comprehensive analysis of the current scientific research and public awareness regarding the Metaverse and its ethical dimensions using bibliographic analysis and a global survey. To highlight the necessity for additional research and more effective governance mechanisms in the Metaverse, we will also feature AI-based technology that illustrates how insights can be derived beyond the traditional boundaries of private data. In conclusion, we aim to propose future research and development directions within the Metaverse ecosystem, stressing the need for effective privacy measures and ethical standards.

2. THE METAVERSE

The term "Metaverse" originated from Neal Stephenson's 1992 science fiction novel, *Snow Crash*. This word blends the prefix "meta" with "universe," representing a digitally constructed universe consisting of persistent, interactive, shared, 3D virtual spaces. In *Snow Crash*, Stephenson envisions the Metaverse as a vast virtual realm mirroring the physical world, where humans, embodied as avatars, engage with each other and software agents in a space reminiscent of the real world. The Metaverse, a virtual reality-focused internet, is touted as the future successor of the internet. This concept has gained significant traction since *Snow Crash*, inspiring the development of online virtual worlds such as *Second Life* and *Active Worlds*. Initially, the Metaverse concept primarily influenced internet-based video games and the creation of social media (Babu & Mohan, 2022).

The Metaverse can be seen as an interconnected network of advanced virtual worlds linked with the physical world through specific hardware and biological interfaces and complemented by software technologies, services, and data. The Metaverse is a form of Extended Reality (XR), a continuum bridging the XR and real worlds. While XR is a current reality, the Metaverse remains an aspirational idea. Contemporary XR includes



technologies like Augmented Reality (AR) and Virtual Reality (VR), which gather human data through various channels and methods. The real world is the physical realm we experience without technology (Stephens, 2022).

VR places an avatar in a digitally crafted three-dimensional world, like Zeppetto, creating the illusion of being in a different location, unrestricted by physical limitations. AR, with its relatively simple hardware, such as glasses, offers a more tangible solution, though it's suitable for shorter content. Mixed Reality (MR) combines VR and AR, enabling user interaction with virtual objects within a 3D environment. It merges the immersive virtual environment of VR and the overlay of virtual content in AR (Park & Kim, 2022).

The modern Metaverse differs from its earlier version in three main aspects (Park & Kim, 2022). First, rapid advancements in deep learning have substantially enhanced the accuracy of vision and language recognition. The development of generative models has facilitated more immersive environments and natural movement. The processing time and complexity have been minimized using multimodal models as end-to-end solutions with a pre-trained multimodal model (Park & Kim, 2022).

Second, the current Metaverse, unlike its predecessor, which was predominantly PC-based and lacked consistency due to spatial and temporal limitations, is now readily accessible anytime, anywhere through mobile devices with constant internet connectivity. Platforms like Roblox host 50 million games, with users logging 3 billion hours monthly, surpassing social network platforms like TikTok and YouTube. As user engagement and usage times increase, content creators earn higher revenues, which boosts digital advertising sales (Park & Kim, 2022).

Lastly, the Metaverse continues to evolve, differentiating from its predecessors in that coding can now be executed within the Metaverse itself. It is also more tightly integrated with real life through virtual currency. The Metaverse expands with various social implications such as fashion, events, gaming, education, and work, all rooted in immersive interaction (Park & Kim, 2022).

Cryptocurrencies like Dime are an economic link between the Metaverse and the physical world. In Roblox, Robux acts as a virtual currency, and Fortnite has V-Bucks. Decentralized Finance (DeFi) also permeates the Metaverse. Non-Fungible Tokens (NFT) add another layer of uniqueness and security to digital assets. Users can own unique virtual assets, such as virtual real estate, digital art, or even digital pets, secured by blockchain technology (Stephens, 2022).

The Metaverse is expanding with digital twins and digital me, revolutionizing human identity. A digital twin refers to a virtual counterpart of a physical asset or a process, representing it in the Metaverse, providing real-time monitoring, simulation, and optimization. A digital me is a self-aware avatar in the Metaverse that represents its owner's values, experiences, and characteristics in an online setting (Babu & Mohan, 2022).

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From this discussion, it's clear the Metaverse while stemming from early conceptions in science fiction and online gaming, has expanded its horizons to encompass various aspects of daily life. As technology continues to evolve, so too will the applications of the Metaverse, paving the way for new possibilities. However, it's also important to consider the potential ethical and governance challenges such developments might bring.

In a study (Damar, 2021), the data of all documents from 1990-2021 from the Web of Science database was extracted. The study observed a few studies whose popularity has peaked in recent months. It was pointed out that the metaverse was heavily associated with virtual reality and augmented reality technologies.



Furthermore, its applications were highest in the sectors of education and digital marketing. The study concluded that the Metaverse will be shaping our lives in the next few decades by taking advantage of the opportunities of developing technology.

The metaverse is poised to revolutionize how we interact with digital environments through augmented and virtual reality technologies. In this light, popular virtual environments like Second Life, Fortnite, Roblox, and VRChat provide insight into the metaverse's potential socio-economic impact (Dwivedi, 2022). Although the complete technology and infrastructure are yet to exist for a fully functional cross-platform metaverse, the transformative potential of the metaverse is being actively studied. Impact areas include marketing, education, healthcare, and societal aspects, among others.

Expert perspectives from various disciplines combine to scrutinize topics related to the metaverse, concluding with a proposed research agenda that could be beneficial for researchers, professionals, and policymakers (Yemenici, 2022). The exploration delves into entrepreneurship opportunities, challenges, and potential effects on the business world and social life standards.

Entrepreneurship in the metaverse is seen as a ripe opportunity. However, the initial costs for participation might be high, suggesting that entrepreneurs solidify their ideas and assess their feasibility in the virtual world. This exploration represents one of the few that examine entrepreneurship in the metaverse, aiming to shed light on the associated problems and opportunities (Yemenici, 2022).

The rapid development of the metaverse is expected to have widespread effects on humanity, both positive and negative. Amid concerns about digital manipulation, it is argued that understanding imminent risks is crucial before diving headlong into the metaverse (Serpil & Karaca, 2023). Philosophical perspectives on human creation could provide valuable insights in raising awareness about these risks. The focus is on analyzing cognitive processes underlying mainstream attitudes and perspectives towards the metaverse, offering a roadmap for understanding this digital transformation (Serpil & Karaca, 2023).

2.1. The Metaverse Applications

Listed below are some Metaverse use cases and applications in different sectors of the world;

2.1.1. Gaming

The gaming sector is considered a significant early adopter and investor in the Metaverse technology. It enables players to interact within a single, interoperable environment. Games like The Sandbox, Sorare, and Axie Infinity are successful examples of the Metaverse in the online gaming industry. The Metaverse games, with attributes such as a full-fledged social environment, cryptocurrency earning potential, compatibility with in-game NFT assets, and a mixed reality experience, offer unique gaming experiences.

2.1.2. Travel and Tourism

Virtual tourism, a progressive application of the Metaverse, facilitates virtual exploration, ideal for those unable to travel long distances. Creating immersive digital experiences using AR and VR is a breakthrough in the travel industry. Thomas Cook's Virtual Reality Holiday "Try before you Fly" is a perfect example.

2.1.3. Education and Learning

The Metaverse's potential in education and learning is substantial. It allows students to watch live experiments, enhancing the learning experience. An example includes New York school students learning astronomy in a virtual spaceship. It also removes language barriers, allowing students worldwide to learn in a shared digital space. Microsoft's Mesh, a mixed-reality platform, is another instance where learners can interact using 3D avatars.



2.1.4. Remote Working

The Metaverse radically transforms traditional business models. Companies like Nike, Intel, YouTube, McDonalds, and emerging startups like Gravity Sketch and Upland have embraced the Metaverse's virtual business architecture. It enables VR training for employees, virtual communication and collaboration, and conducting meetings with 3D avatars.

2.1.5. Real Estate

The Metaverse has also found a place in the real estate sector by offering clients immersive virtual reality experiences. Clients can explore properties in real-time via virtual tours, saving them the time and effort of physical visits. Moreover, these virtual tours can be customized to suit clients' preferences and needs.

2.1.6. Healthcare (Intelligent)

The Metaverse technology provides innovative ways of delivering treatments, resulting in improved outcomes at lower costs. The Metaverse technology powers concepts like Telemedicine and Telehealth, digital therapies, and digital workouts. Digital Twin technology is another noteworthy application, creating a patient's digital representation for testing treatments. On top of this, the metaverse, a convergence of technological and sociological advancements, has potential applications beyond entertainment and social networking. It can be used in fields like professional training, education, supply chains, real estate marketing, and even healthcare, as demonstrated by the concept of MeTAI (Wang, 2022). The substantial growth of telemedicine during the COVID-19 pandemic indicates the potential speed of metaverse adoption. Initiatives are needed to develop the healthcare metaverse, or MeTAI, to ensure it is cost-effective, user-friendly, high-performing, safe, equitable, and ethical while balancing hype with realistic expectations.

2.1.7. Banking and Finance

The Metaverse application in banking offers a complete overview of physical banks from any location. This technology, along with blockchain, NFT marketplace development, and other DeFi cryptocurrency assets, brings substantial advantages to banking, enhancing customer experiences with personalized services and data visualization.

2.1.8. Social Media and Entertainment

The Metaverse technology has significantly transformed online entertainment in social media. Users now communicate using digital avatars and virtual clones. Facebook's name change to Meta signifies abundant opportunities in the digital media space. The Metaverse applications are also emerging in industries like fashion, eCommerce, sports, and potentially in the manufacturing IoT and supply chain industry.

2.1.9. Digital Anti-Aging

The metaverse harbors potential benefits in digital anti-aging by providing virtual healthcare, fitness programs, and opportunities for socialization. It delves into integrating these services into the metaverse while acknowledging the potential challenges that might emerge (Mozumder, 2023). Additionally, it highlights the metaverse's potential for managing chronic diseases by transitioning existing digital solutions into the virtual environment, employing holographic construction and simulation, fusion of the virtual and real, and virtual-real linkage. There is a suggestion for integrating AI, IoT, and brain-computer interfaces to develop medical equipment and methods for the simulation process. However, it's recognized that these technologies are still in their developmental stages, necessitating further research.

2.2. Innovation Dilemma

Immersive technology is just like atom splitting. It can be used to help mankind, lifting mankind, or it can be



used for destroying mankind. That's where we are with virtual reality. We're on the cusp of having powerful tools like fire. What are we going to do with it? How are we going to use it? How are we going to put in safeguards so that we don't get burned? (Heller, 2021).

Since our inception, our natural propensity towards discovery and invention has shaped our existence. We perpetually strive to invent new tools and modify our surroundings, a process we commonly term as innovation.

However, innovation carries its own burdens, often manifesting as unforeseen consequences. Consider the case of DDT (Dichlorodiphenyltrichloroethane), a widely used pesticide of the past. The adverse environmental effects of DDT are well-documented, notably its near eradication of the bald eagle, America's emblematic bird. However, post the 1972 agricultural ban of DDT in the US, the bald eagle population has made a remarkable recovery. Paradoxically, DDT has saved countless lives by assisting in eradicating malaria in the US and Europe. Presently, malaria cases in these areas are restricted to individuals returning from tropical regions, where malaria continues to be a significant issue.

While DDT symbolizes well-intentioned innovation gone awry, sometimes innovation can be intentionally misused. Social media platforms exemplify this. They have positively transformed lives by helping people reconnect with old friends and stay connected with family. However, they also facilitate the spread of misinformation, affecting public opinion and electoral choices. The anonymity provided by these platforms has unfortunately empowered cyberbullying, causing distress and harm. Furthermore, as exposed by the Facebook Cambridge Analytica scandal, these platforms can misuse user data.

Given our problem-solving nature, innovation will persist. But we must comprehend the potential repercussions of our creations. The Metaverse is one such recent innovation that requires caution. In the subsequent section, we'll discuss why robust technology is crucial for the Metaverse while emphasizing the importance of governance, data privacy, and ethical considerations. (Kellenberger & Davidson, 2019).

Privacy is like oxygen; we really appreciate it only when it is gone. —Charles Sykes (1999)

2.3. User-Privacy Concern

The Metaverse is not simply an evolution of our digital experience but a revolution, offering an unprecedented level of integration between the digital and physical realms. With applications like Geppetto, Animal Crossing, and Roblox boasting hundreds of millions of users, the Metaverse captures the social values of Generation Z, where online personas are as substantial as their real-world counterparts (Park & Kim, 2022).

However, this growing influx of users entering the Metaverse also means an increase in personal information being willingly surrendered, often without a comprehensive understanding of the consequences. Individuals will unwittingly create permanent profiles surpassing the data footprints left on social media platforms. Why does this differ from our current digital context? And what could be the tangible impact of this shift?

The Metaverse, as a blend of numerous cutting-edge technologies, offers a much more immersive experience compared to conventional platforms, such as AR, VR, and AI. Such technologies enable hyper-personalized and contextual interactions, leading to more sophisticated data capture and profiling (Babu & Mohan, 2022; Vladimirov, Nenova, Nikolova, & Terneva, 2022). Furthermore, the lack of consensus on data governance and ethical norms in this new domain amplifies the potential risks to privacy and security.

While these concerns might seem speculative to consensus-based thinkers who require collective agreement before accepting such statements, those open to personal logic may resonate with the assertion that the Metaverse could potentially result in digital incarceration—an outcome arguably worse than real-world imprisonment due to its widespread and irreversible nature. However, it is crucial that these arguments are effectively communicated to suit both groups of thinkers.



This paper addresses this challenge by presenting empirical evidence and reasoned arguments. It offers a thorough analysis of the technologies shaping the Metaverse, the potential benefits and drawbacks, and highlights the current challenges and the need for further research. Notably, it examines the use of cutting-edge AI technology, such as Spiky.ai, which exemplifies how information can be extrapolated beyond the traditional boundaries of private data. The objective is to provide clear, compelling arguments that appeal to both consensus-based thinkers and those open to personally logical reasoning, promoting an inclusive discussion on the Metaverse and its societal implications.

2.4. Current and Future Technologies

The evolution of the Metaverse is shaping a new era of technological breakthroughs, led by innovations like brain-computer interfaces (BCIs) and augmented reality (AR). BCIs, by converting brain-generated electrical signals into external device commands, are pioneering an unmatched level of human-machine interaction (Vladimirov et al., 2022). Similarly, AR technology enhances our engagement with the Metaverse, integrating real-world elements into the digital landscape to enrich user experiences (Di Pietro & Cresci, 2021).

Nevertheless, this exploration of the Metaverse comes with a slew of risks, particularly in personal data, behavioral analysis, and communication privacy. Social platform-derived data, with its burgeoning growth, is vulnerable to misuse, leading to issues like doxing that compromise privacy (Vladimirov et al., 2022). The amplification of interactions within the Metaverse further heightens the possibility of data misuse and cybercrime.

Security concerns, including content integrity and user authentication, are also prominent (Vladimirov et al., 2022). The impending prominence of quantum computing, known for its complex computations and potential to crack traditional encryption methods, poses an immense challenge to maintaining a secure Metaverse environment.

Furthermore, the Metaverse will evolve the multimedia-centric internet experience to a multi-sensory content delivery platform (Di Pietro & Cresci, 2021). This transformative change would bridge the gap between physical and virtual realities, providing force-return effects that imitate real-world interactions. However, this heightened immersion also intensifies the associated risks, necessitating the creation of robust protective measures as we delve deeper into this digitized reality.

2.5. A Special Metaverse Application: Spiky.AI

There is a novel application by Spiky.ai (2022). It is a new startup utilizing AI to build a better meeting experience. Spiky provides a digital sentiment dashboard that aims to unleash everybody's best potential by utilizing statistical theory to fuel conversational intelligence and to maximize success rates based on experience. Spiky's mission is to empower organizations, communities, and corporations via online meetings, video games, and any interactions by making them more insightful, engaging, and thus efficient. These benefits, in turn, help them to create an inclusive online workplace using artificial intelligence (AI). The AI tool respects data privacy by not copying any data to its servers – instead uses the storage of their users. The ultimate objective of Spiky is to offer a personalized experience by which the users have empowered engagement and enhanced communication among themselves. Finally, this leads to a brighter future for hybrid and online workplaces and unleashes the best potential in everyone.

Spiky incorporates 20 AI models that evaluate three verticals of metrics. They have verbal cues, such as objectivity and positivity, vocal cues such as energy level and emotional vocal tone, and non-verbal cues from eye movement, nodding, and facial expressions. This technology provides 50+ metrics in the backend to create a comprehensive picture of what happened each second of the video. They can then correlate these metrics with how well a meeting went, based on any success metric one might have. In their current focus, they evaluate sales meetings and customer calls to give salespeople more average success per meeting.

Furthermore, their technology has been incorporating aspects of generative AI to analyze context feedback to create a personalized coaching engine.

Their technology appears to have the most in-depth perspective on conversation compared to anything on the market. Technologies such as Spiky.AI are proof of the innovation of technology surrounding the Metaverse. Implementing such technologies would allow the Metaverse to gather user behavioral data.

3. METHODS

3.1. Bibliographic search

Bibliometric analysis of the Metaverse-related publications was performed to understand the interesting trend in the Metaverse as a concept in Google Ngram and in scientific publications using Google Scholar.

3.2. Survey

Furthermore, a survey was conducted globally to qualitatively and quantitatively understand people's perceptions of the Metaverse. To better understand the public's perception of the Metaverse and to validate the information presented in this paper, the survey was conducted with 22 questions using an online Google Form. Six questions were demographic, and the rest (16) were explorative ones about the public's knowledge.

3.3. Spiky.ai

Finally, an AI-based analysis of video recordings (meetings, video game sessions, and YouTube) was performed using the text and voice data to demonstrate what kind of behavior quantification can be obtained. There are different tools available in the market depending on the applications. For example, for sales training, gong.io for conversation sentiment analysis, and one for video analytics. For the analysis, Spiky.AI was used as it is the only one that covered conversation, video, and text, making it most relevant to the scope of the Metaverse.

Spiky.ai examines meetings from Zoom, Webex, and Microsoft Teams, and any video uploads, and analyzes the attentiveness, emotion, language used, etc. to give a score of engagement to a meeting. This acts as a metric for a company as it analyzes what goes on in the meetings.

4. RESULTS

4.1. Bibliographic search

Based on the Google Ngram search, we found that the number of the Metaverse relevant terms, e.g. virtual reality, increased steadily between the years 1990 and 2019 (the latest year available) (Fig. 1).

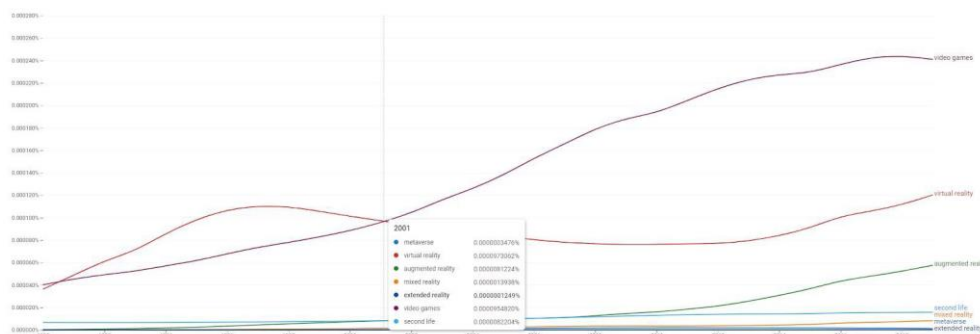


Figure 1. Google Ngram showing the increase in the number of occurrences of the Metaverse relevant terms, e.g., virtual reality.

Popularity of Metaverse and Metaverse & Ethics

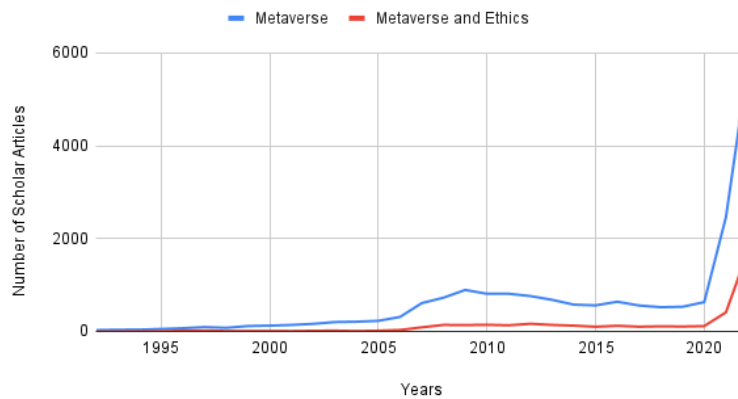


Figure 2. Google Scholar results for Metaverse and Metaverse & Ethics

Google Scholar results showing an exponential increase in the number of publications with the keywords “Metaverse” and “Metaverse & ethics” in the recent years, using the date between the years 1992 and 2022

Popularity of AI

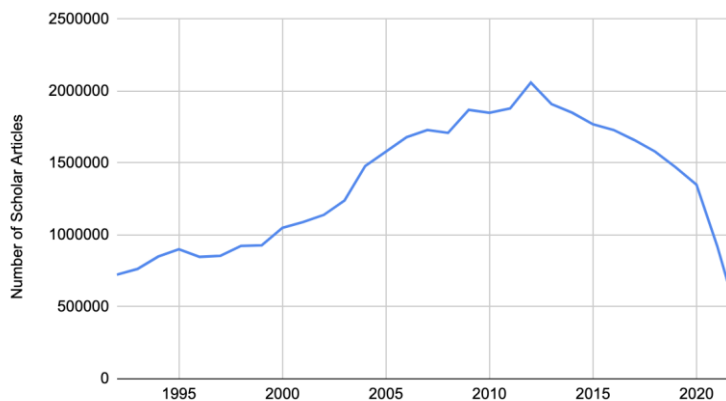


Figure 3 Google Scholar results for AI

Google Scholar results showing an increase until 2012, and then a decline in the number of publications with the keyword “AI” in recent years, using the date between the years 1992 and 2022.

Popularity of Metaverse and AI

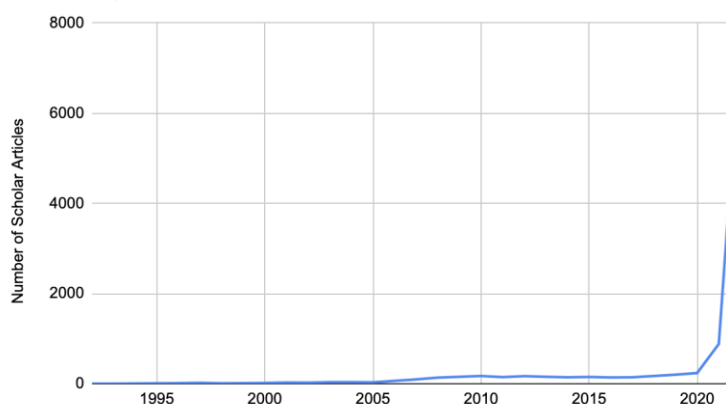


Figure 4 Google Scholar results for Metaverse and AI

Google Scholar results showing an exponential increase in the number of publications with the keywords “Metaverse and AI” in recent years, using the date between the years 1992 and 2022.

4.2. Survey

Following is the summary of responses from a cohort of 97 participants to these 16 questions.

Q1: Have you ever heard of the Metaverse? (Multiple Choice)

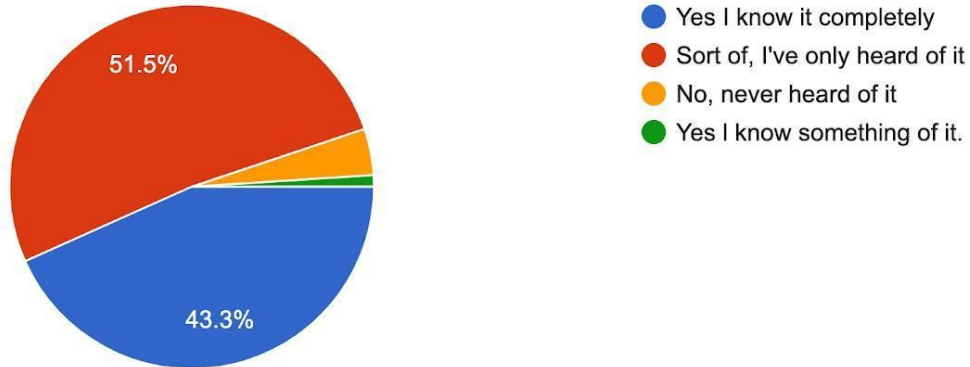


Figure 5. Answers for Q1

Q2: Do you think the Metaverse will be beneficial to society? (Multiple Choice)



Figure 6. Answers for Q2

Q3: How often would you use the Metaverse if it was affordable and easy? (Multiple Choice)

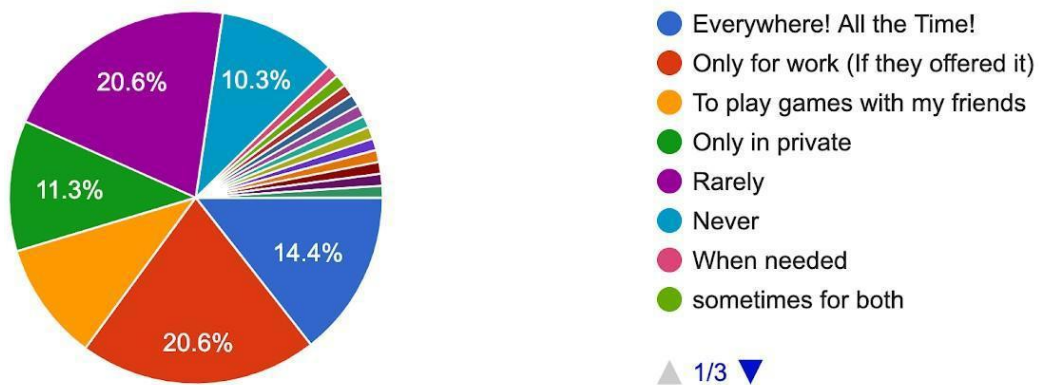


Figure 7. Answers for Q3

Q4: Do you think that if the promises of the Metaverse were to be true, it would be the most innovative technology to develop in the 21 st Century? (Multiple Choice)



Figure 8. Answers for Q4

Q5: Would you use the Metaverse if it were free while collecting your behavior data? (Multiple Choice)



Figure 9. Answers for Q5

Q6: Would you use it in your workspace if it were required? (Multiple Choice)

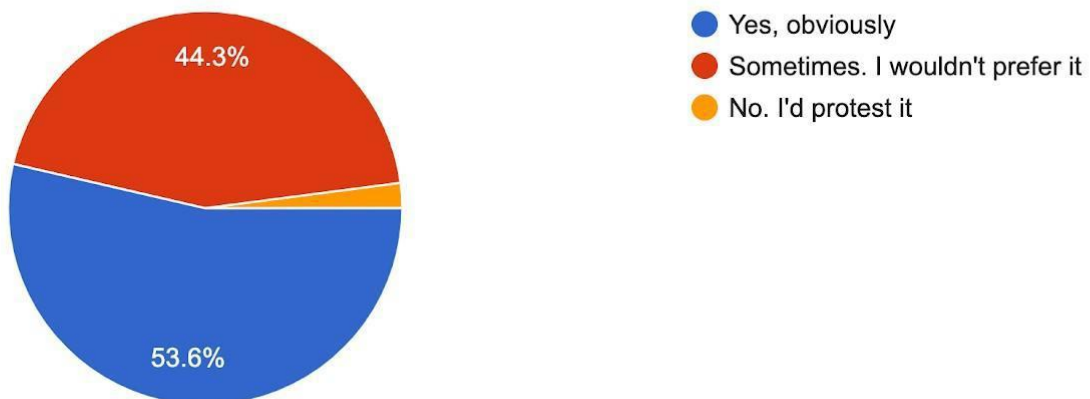


Figure 10. Answers for Q6

Q7: Did you ever have a bad experience on the Internet? (Multiple Choice)

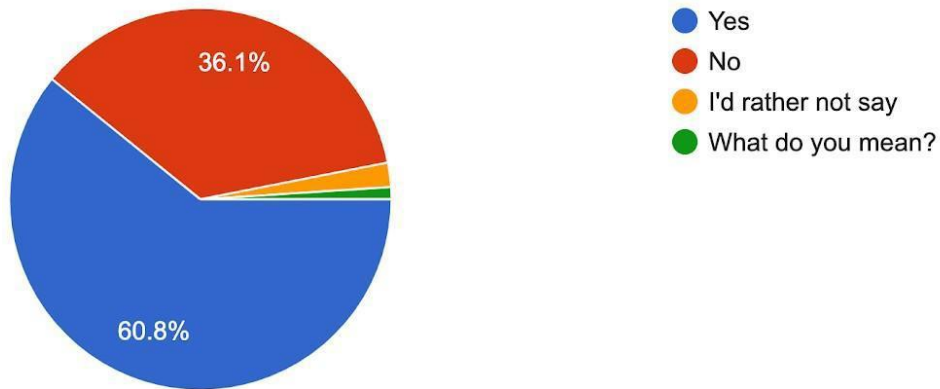


Figure 11. Answers for Q7

Q8: Which area(s) was your bad internet experience in? (Checkboxes)

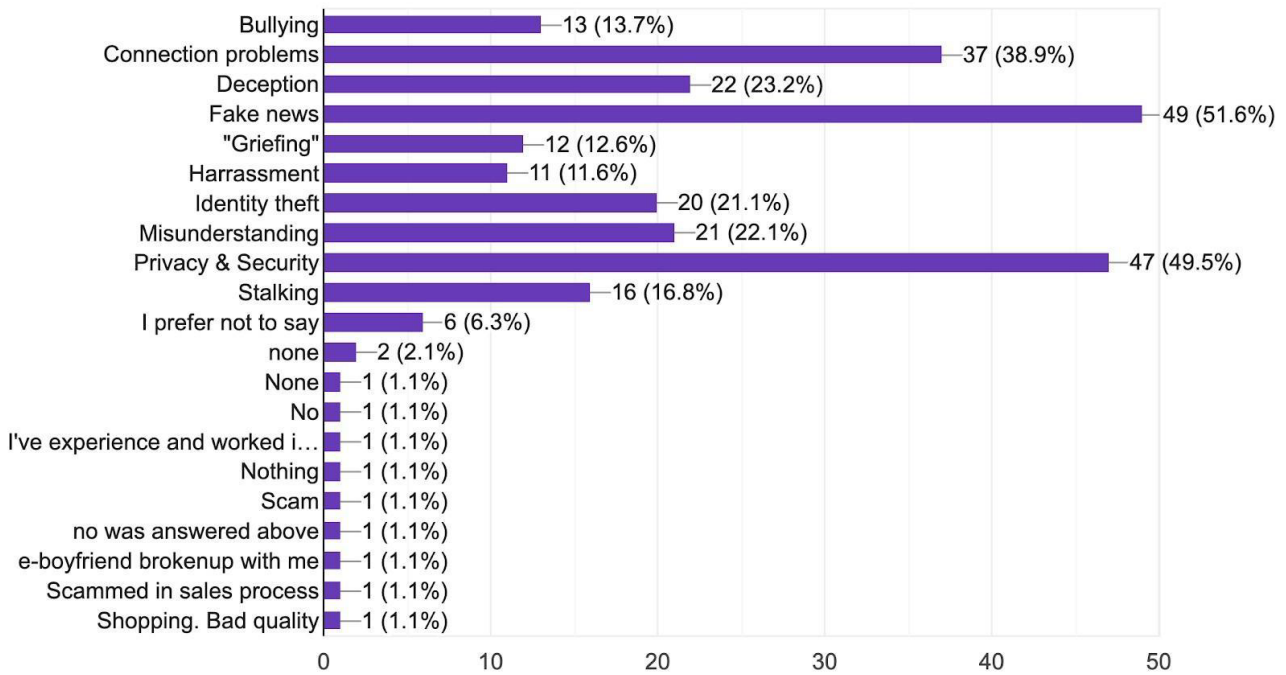


Figure 12. Answers for Q8

Q9: Do you think that same bad experience could be possible on the Metaverse? (Multiple Choice)



Figure 13. Answers for Q9

Q10: Which Industry(-ies), if any, do you think the Metaverse would have an impact on? (Checkboxes)

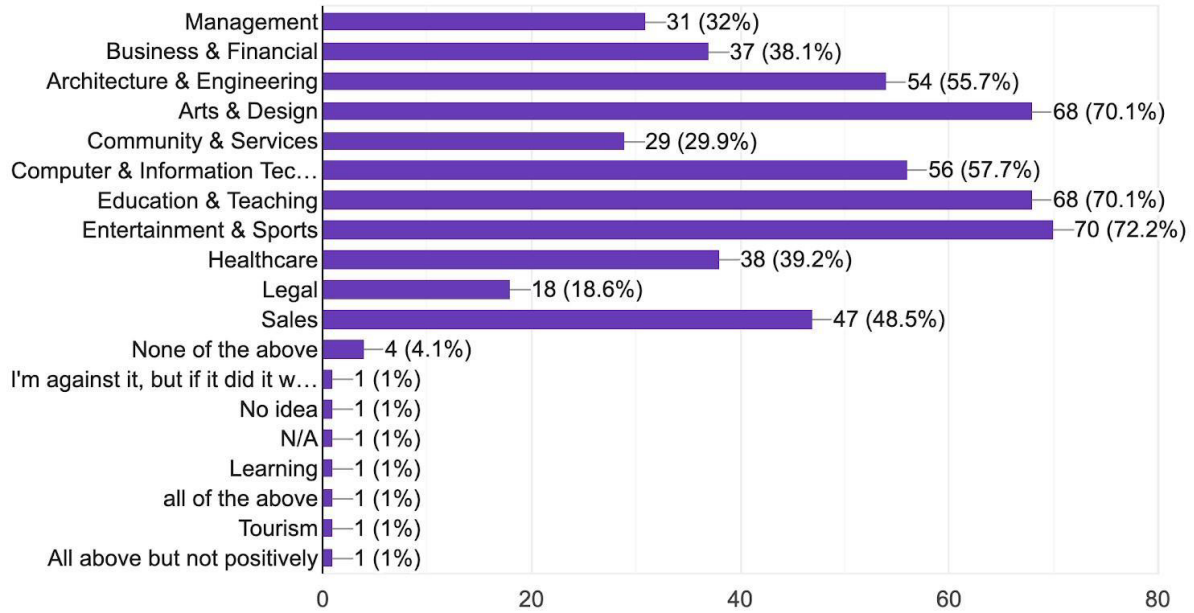


Figure 14. Answers for Q10

Q11: Do you think the Metaverse will be a convincing duplicate of our world? (Multiple Choice)

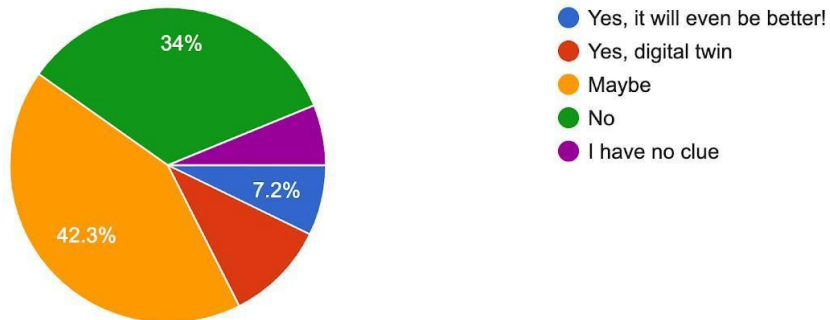


Figure 15. Answers for Q11

Q12: In your opinion, is the Metaverse even possible? (Multiple Choice)

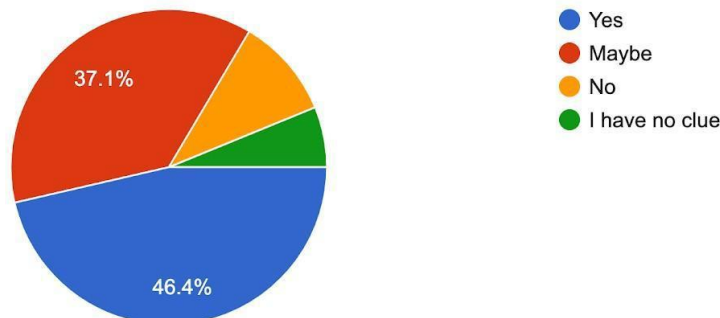


Figure 16. Answers for Q12

Q13: If the Metaverse becomes possible, in how many years do you think it will reach wide-spread use?

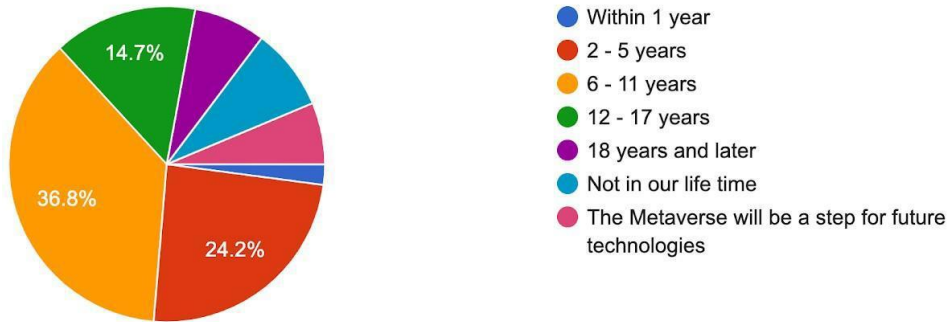


Figure 17. Answers for Q13

4.3. Spiky.ai

Spiky.ai was used to do analysis of 16 videos composed of three categories: 1) meetings, 2) video game sessions and 3) YouTube videos. The analyses of the best example from each category are shown in Figures 18, 19 and 20.

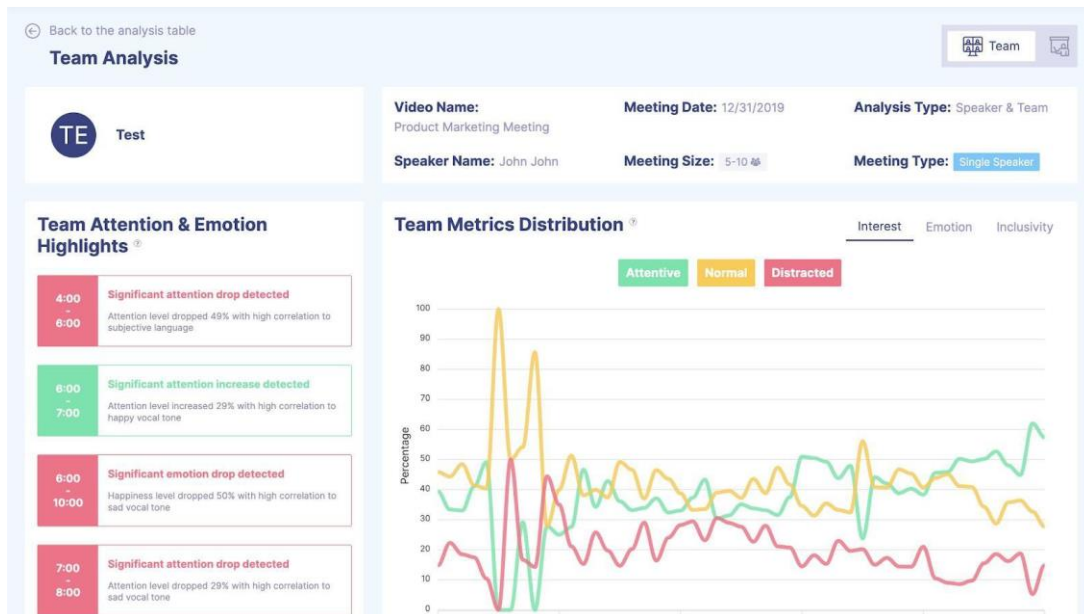


Figure 18a. Analysis of a corporate team meeting

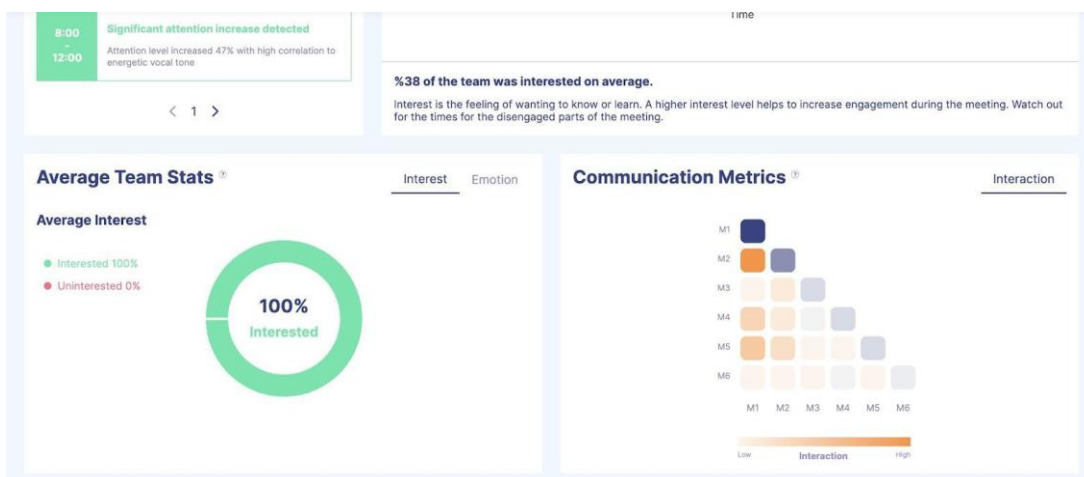


Figure 18b. Analysis of a corporate team meeting

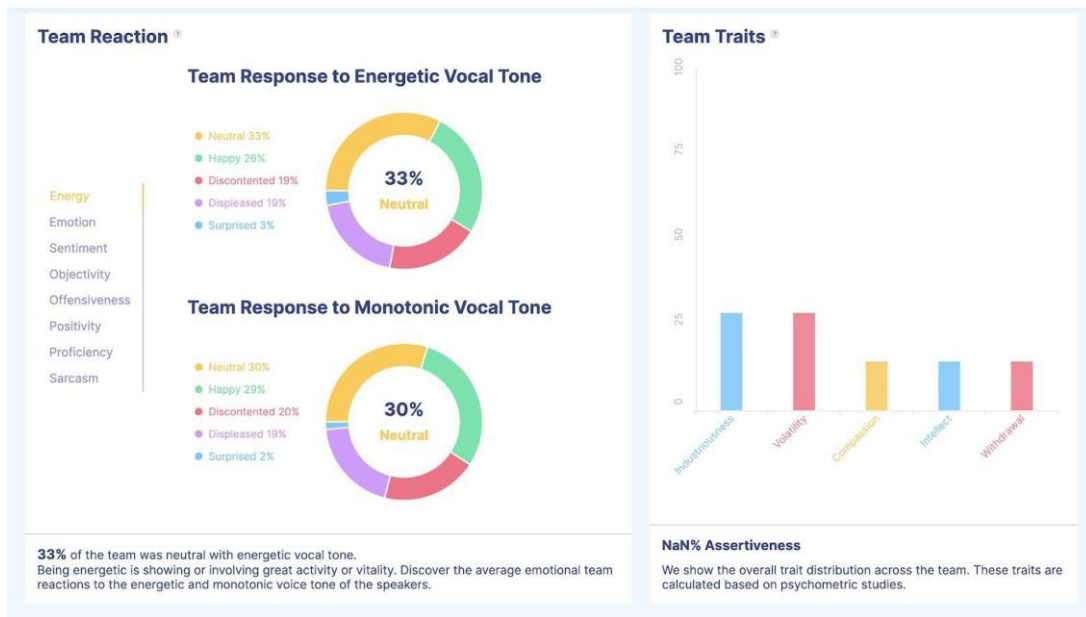


Figure 18c. Analysis of a corporate team meeting

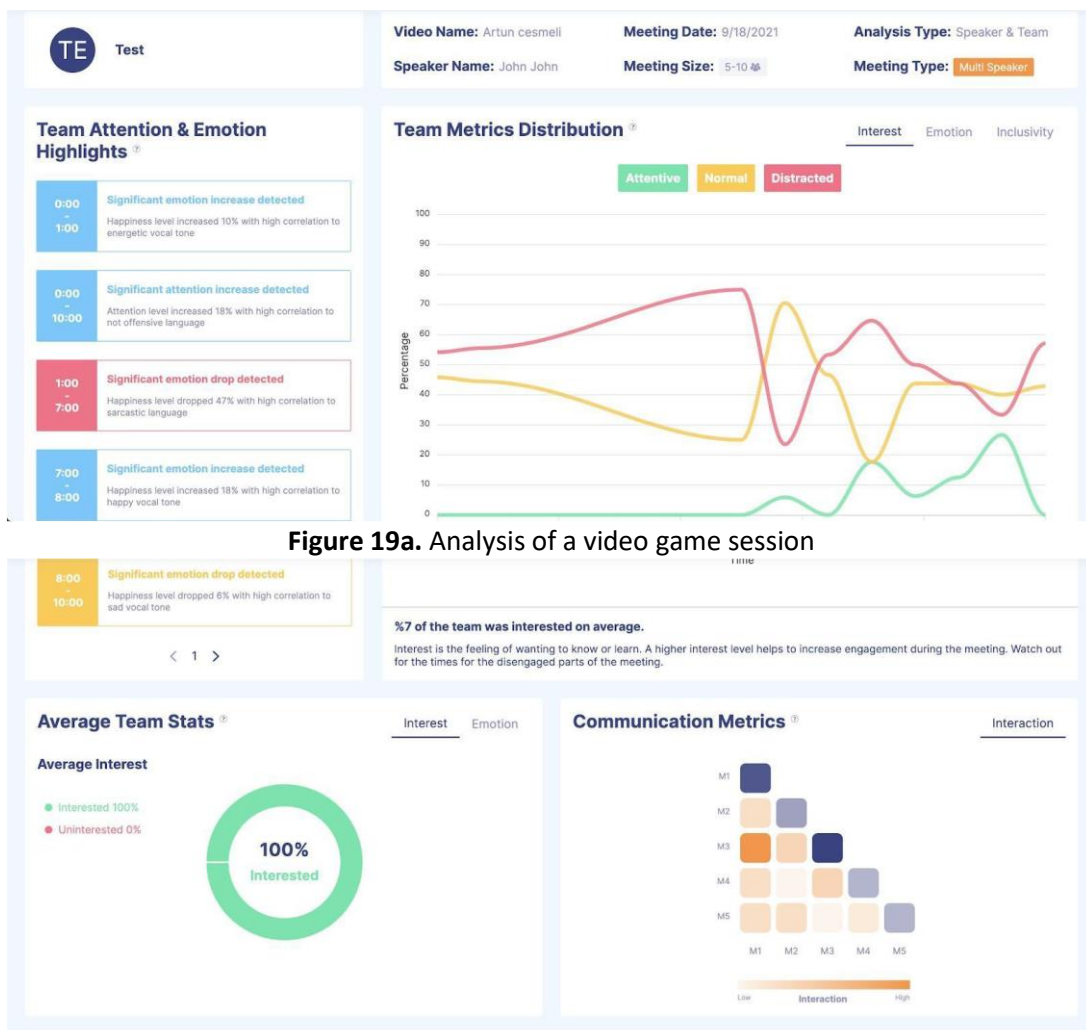


Figure 19b. Analysis of a video game session

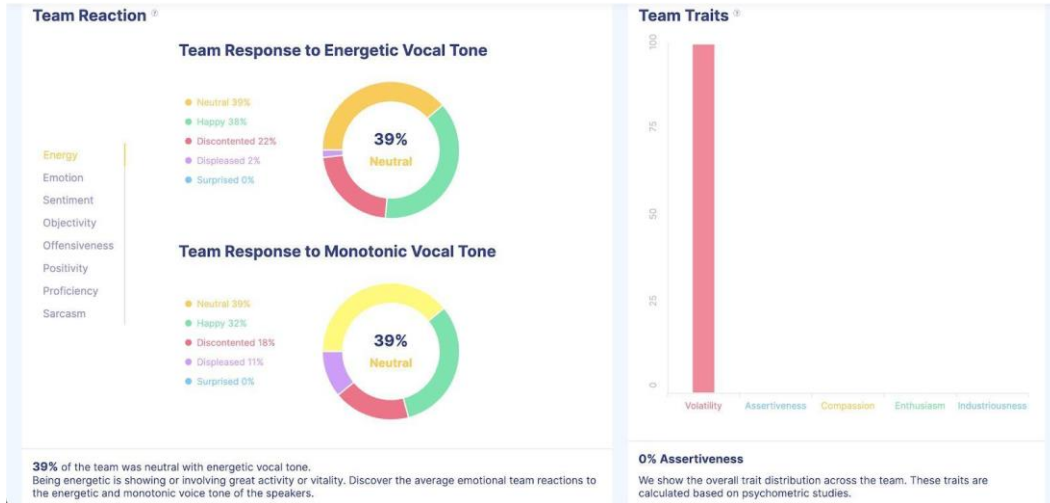


Figure 19c. Analysis of a video game session

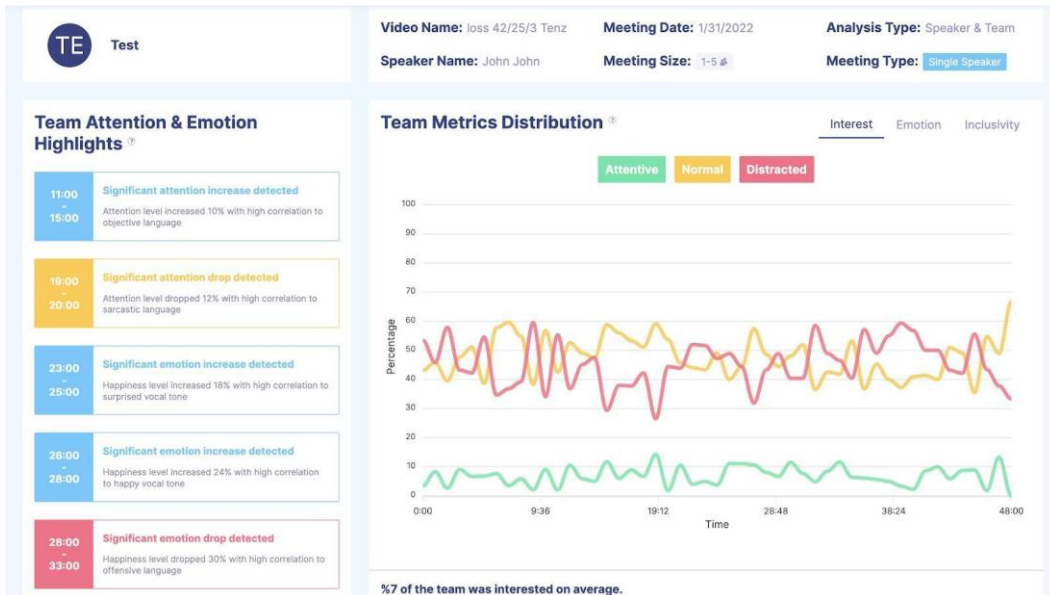


Figure 20a. Analysis of a YouTube video



Figure 20b. Analysis of a YouTube video

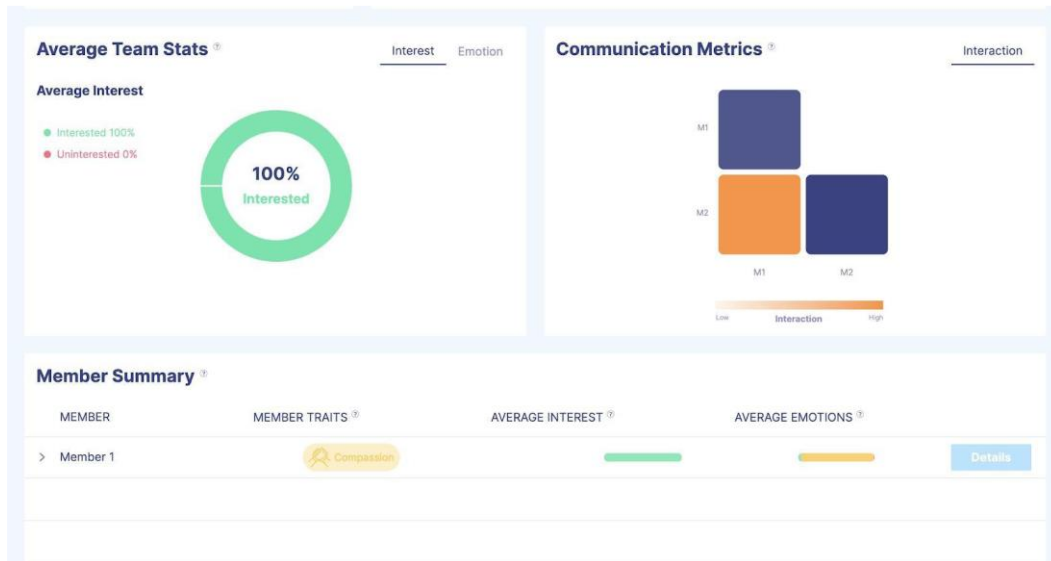


Figure 20c. Analysis of a YouTube video

5. DISCUSSION

5.1. Bibliographic search

According to the Google Ngram search, concepts relevant to the Metaverse have had a steady increase suggesting that the public's interest is on the rise. It is anticipated that the public's awareness will continue to increase.

Similarly, and probably more sharply, scientific publications are expected to increase. A more detailed subset of keywords can be used to see the trends. Those about technology are likely to increase while those about governance and ethics may not have a strong trend unless these topics are encouraged – a purpose of this publication.

5.2. Survey

In addition to the results, there is more information to be extracted from this survey. For example, certain populations followed different trends.

Based on the survey results, other interesting observations can be made:

- Out of the responses,
 - a) 47.3% believe that the Metaverse will bring new opportunities to society
 - b) Out of the 47.3% that believe the Metaverse will bring new opportunities to society;
 - c) 26.2% believe that the Metaverse will reach wide-spread use in 2 to 5 years.
 - d) 50% believe that it will reach widespread use in 6 to 11 years.
 - e) 14.2% believe that it will reach use in 12 to 17 years.
 - f) 4.8% believe that it will reach use later than 18 years.
 - g) 0% said it won't be used in our lifetime
 - h) 4.8% believe that the Metaverse will be a step for future technologies.
- 19.1% has a Doctorate Degree:
 - a) 17.6% believe that the Metaverse will revolutionize our world.

- b) 45% believe that it will be the best technology of the 2020s
- c) 17.6% believe it will just be another Facebook (Meta)
- d) 9.8% believe that it will have no effect e. 10.0% have no clue
- 51.1% of the respondents have experienced privacy and security issues. 92% of these people agree that it can happen on the Metaverse.
- Out of the 34% females:
 - a) 49% said yes to allowing the Metaverse to collect data.
 - b) 51% said no.
- Out of the 61.7% males:
 - a) 42% said no to allowing the Metaverse to collect data.
 - b) 58% said yes.

5.3. Spiky.ai

Utilizing verbal, vocal and non-verbal cues along with emotional vocal tone, Spiky.ai provided several metrics by analyzing every second of the sample videos. As a result, the psychographic reports inform the leadership about the effectiveness of the meetings.

- For example, in the corporate meeting (Fig. 18) the monotonic tone made the team happier (29%) vs. the energetic tone did (26%).
- In the case of gaming (Fig. 19), however, the energetic tone resulted in 38% vs 32% happiness with the team, compared to the monotonic tone.
- In the last example of a YouTube video, compassion did not bring much happiness (6%) but the interest was high (100%) with the team.

Our results are not comprehensive to draw definite conclusions. However, they are directionally consistent with the results of similar studies. Additional insights were also obtained with the survey and innovative AI-based analysis with the example of spiky.ai results.

In the future studies, the sample size and diversity used in the survey and AI should be increased. For the bibliographic analysis, only those publications with English were included; publications in other languages, e.g., French, Spanish, and Chinese, should be included for a better representation to draw conclusions worldwide.

6. CONCLUSION

This paper focused on the Metaverse and the potential challenges that would make people feel incarcerated rather than letting them enjoy freedom.

Accordingly, three different types of analysis were performed. The bibliographic analysis showed the privacy and security aspects of the Metaverse. The survey demonstrated that the insight and awareness of the public about the Metaverse is still immature. Finally, Spiky.ai based analysis illustrated that new tools are available to obtain the virtual mind-prints of the users/their avatars. If the latter is not protected along with the standard personal information, the Metaverse – which is otherwise full of potential to offer value to the society, to the economy, and to many other areas, may end up being harmful to humankind. This outcome would be even worse than being incarcerated in the real-world.



Looking at social media, gaming, online harassment, and other challenges with user safety and speech-related harms in online spaces may offer a cautionary example for anticipating and addressing emerging problems with immersive experiences (Heller, 2021).

Combining the results from this study and those from the others (Stephens, 2022), the recommendations include:

- We must build a general awareness of the problem: we must understand what the Metaverse is, its governance challenges and feasible opportunities are.
- While we need governance at a universal level, it must adapt to the characteristics of industry and markets, suggesting that the importance of this topic spans across geographies, industries, and disciplines.
- There must be data sharing and auditing across different entities including governing bodies, and this requires standards, educators, auditors, and enforcers.
- Because the speed of technological innovation is so fast, there must be an agile framework that responds to changes and observations from deploying these technologies.
- The issue of long-term research needs committed funding, and it should be spread across multiple disciplines—sciences, social sciences, and politics—to do justice to the emerging phenomena.
- We should start involving all age groups in the studies and regulations as the topic is relevant to all but also especially the vulnerable groups like children and elderly.
- We should not only cover technology and governance elements of the protection of privacy but enhance the Metaverse with ethics. This would not only make the Metaverse a safer place, it would also provide a “mirror” effect on the real-world, as we iterate between the two “universes”.

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