Cyberbullying in the Metaverse:
A Prescriptive Perception on Global Information Systems for User Protection

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ABSTRACT

The emergence of the metaverse, a virtual reality space, has ushered in a new era of digital experiences and interactions in global information systems. With its unique social norms and behaviors, this new world presents exciting opportunities for users to connect, socialize, and explore. However, as people spend more time in the metaverse, it has become increasingly apparent that the issue of cyberbullying needs to be addressed. Cyberbullying is a serious problem that can harm victims psychologically and physically. It involves using technology to harass, intimidate, or humiliate individuals or groups in global information systems. The risk of cyberbullying is high in the metaverse, where users are often anonymous. Therefore, it is crucial to establish a safer and more respectful culture within the metaverse to detect and prevent such incidents from happening.

KEYWORDS

Cyberbullying, Global Information Systems, Metaverse

INTRODUCTION

Global information systems (GIS) present a global schema of the data available in its underlying component autonomous information systems (Kameny,1989). Advances in computer hardware technology, relational data management systems, XML ontologies, software expert systems, and secure online networks have enabled the development of GIS. GIS profoundly impacts scientific discovery,

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industrial development, and knowledge communication (Frenkel, 2009). GIS provides users with a centralized and transparent view of many heterogeneous and distributed sources of data (Getta, 2011).

Table 1 provides many examples of GIS. Due to developments in artificial intelligence (AI), virtual reality (VR), augmented reality (AR), and blockchain, the metaverse has become the newest component of GIS (Deveci et al., 2022; Fatemidokht et al., 2021; Gaurav, 2022; Gupta et al., 2023; Wang et al., 2020). The metaverse concept has evolved significantly over the years, from its earliest roots in science fiction to its current state as a burgeoning field of research and development.

The idea of a metaverse can be traced back to the 1970s, when science fiction authors began to imagine virtual worlds that anyone with a computer could explore (Dionisio et al., 2013). These early visions of the metaverse were often dystopian, featuring vast, interconnected networks of virtual spaces controlled by corporations or governments. In the 1980s and 1990s, the metaverse concept began to take shape, partly with the development of VR and the internet. In 1992, the novel *Snow Crash* by Neal Stephenson introduced the idea of a VR metaverse called "The Metaverse," accessible to anyone with the right equipment (Joshua, 2017). Over the next few decades, various virtual worlds emerged, including online gaming environments like Second Life and World of Warcraft or social media platforms like Facebook and Twitter (Baruah et al., 2012). These platforms allowed users to create avatars and interact with others in virtual spaces, blurring the lines between the real and virtual worlds. The current vision of the metaverse is one in which people can fully immerse themselves in virtual worlds indistinguishable from reality, allowing for new forms of social interaction, commerce, and entertainment. Due to this, it becomes a potential research area in GIS.

While the metaverse offers exciting possibilities for social interaction, commerce, and entertainment for GIS, several dark sides must be carefully considered (Tugtekin, 2023). One of the most pressing

Table 1. Examples of global information systems

GIS	Description	Key Features	Application in Cyberbullying Prevention
Social Media Monitoring System	Detects cyberbullying on social media	Real-time monitoring, keyword detection, sentiment analysis	Identifying and flagging cyberbullying posts or comments on social media platforms
User Behavior Analytics System	Analytics system that analyzes user behavior patterns to detect and predict cyberbullying incidents	Machine learning algorithms, anomaly detection, behavioral profiling	Identifying abnormal patterns of behavior indicative of cyberbullying and providing early intervention
Reporting and Incident Management System	System that facilitates the reporting and management of cyberbullying incidents	User-friendly reporting interface, incident tracking, communication channels	Allowing users to report incidents, providing a centralized platform for managing and resolving reported cases
Educational and Awareness Platform	Platform that offers educational resources and promotes awareness about cyberbullying	Informational content, interactive modules, community engagement	Educating users about cyberbullying, providing resources for prevention, and fostering a supportive community
Collaborative Filtering System	System that uses collaborative filtering techniques to personalize user experiences and filter out potentially harmful content	Recommendation algorithms, content filtering, user preferences	Filtering out cyberbullying-related content from a user's feed and promoting positive interactions

concerns related to the metaverse is the potential for addiction. The metaverse can be highly addictive, particularly for those seeking escape from the stresses and pressures of the real world. This can, in turn, lead to problems with productivity, social isolation, and physical health (Dwivedi et al., 2022). The metaverse may also exacerbate social inequality. Access to the technology and resources needed to participate fully in the metaverse may be limited to certain groups, widening the gap between the haves and have-not's or potentially creating new social stratification and exclusion forms.

Privacy is another major concern related to the metaverse in GIS (Bhardwaj & Kaushik, 2022; Falchuk et al., 2018). As users become more immersed in virtual worlds, they may inadvertently share personal information that could be used for nefarious purposes. The technology used to create e the metaverse may also collect and store data on users' activities, raising questions about who has access to this information and how it is used. Ethical and governance concerns are paramount when it comes to the metaverse.

The current research focuses on addressing concerns related to cyberbullying in the metaverse with a prescriptive perception of GIS. The metaverse is a rapidly growing GIS and virtual space in which people interact with each other and engage in various activities. This popular online platform offers countless opportunities for socializing, learning, and entertainment (Buana, 2023).

The risk of cyberbullying, therefore, comes with the increasing use of the metaverse in GIS. Cyberbullying uses technology to harass, threaten, humiliate, or harm others. It can take many forms, including text messages, social media posts, and videos. It can happen to anyone, regardless of age or location. Cyberbullying can have serious consequences, including mental health issues, school problems, and suicide. Individuals need to be aware of the signs of cyberbullying and to know how to respond if they or someone they know is being bullied online (Slonje et al., 2013). Parents, educators, and community leaders can play a role in addressing cyberbullying by educating themselves and others about the issue and promoting the safe and responsible use of technology.

Cyberbullying can also occur in the metaverse, a virtual world, or a collection of virtual worlds accessed online. In the metaverse, individuals can interact with one another using avatars and participate in gaming, socializing, and commerce (Qasem et al., 2022). The metaverse is a digital space; thus, cyberbullies can hide their identities and engage in harmful behavior.

This article presents a comprehensive analysis on the potential concern of cyberbullying in the metaverse with a prescriptive perception of GIS. The research aims to find the answer to these research questions:

RQ1: What are the potential forms of cyberbullying in the metaverse with a prescriptive perception of GIS?

RQ2: What are the latest solutions for detecting cyberbullying in the metaverse?

LITERATURE REVIEW

Cyberattacks, distributed denial-of-service (DDoS) attacks (Abbas et al., 2021; Singh & Gupta, 2022; Wahab et al., 2020), and phishing schemes (Almomani et al., 2022) affect GIS. However, the incidence of cyberbullying in the metaverse varies. Rates of cybervictimization and cyber-perpetration were determined to be between 2.8% and 31.5% and 3.0% and 30.6%, respectively, in a meta-analysis (Henares-Montiel et al., 2022). During the early phases of the COVID-19 pandemic in 2020, Trompeter et al. (2022) observed that cyberbullying among Australian high school students surged dramatically. Cyberbullying may have serious consequences on a person's mental health, as shown by Rajan et al. (2022). Consistent definitions and measures, identification of risk and protective variables, and the creation of effective preventative and intervention programs are some of the issues and gaps in cyberbullying research discussed by Strohmeier and Gradinger (2022).

The effects of metaverse cyberbullying, especially on female victims, may be devastating. Cyberbullying may cause women to feel helpless, ashamed, or unable to advance in their careers (Tang

et al., 2023). Ünal- Aydın et al. (2023) observed that adolescents with anxiety disorders may have defective metacognitions, which can play a role in predicting cyberbullying and cybervictimization. Yosep et al. (2023) argued that e-parenting may be an efficient solution in the fight against the damage done by cyberbullying to students. Last, Sebastian et al. (2023) stressed the need for a legislative framework for cybersecurity risk governance to reduce dangers that plague metaverse platforms.

The legal structure for dealing with cyberbullying in the metaverse is still under development. To encourage cooperation between countries, aid in criminal investigation, and encourage democratic rule of law, Qin et al. (2022) proposed the establishment of a universal legal framework. Pate et al. (2022) cited concerns about privacy and data collecting, cryptocurrencies, and the emergence of a "natural law" as areas where the law may need to be developed in the metaverse. Cyberbullying, as discussed by Strohmeier and Gradinger (2022), is a mediatized psychosocial developmental phenomena that can prevent and intervene as areas for future study. Property law, intellectual property law, privacy and data protection, contract law, cybersecurity, monetary and payment systems law, regulation of virtual assets, tax law, anti-money laundering and know your customer (KYC) law, and criminal law are discussed in detail by Kasiyanto and Kilinç (2022). In sum, the studies point to cyberbullying in the metaverse as a complicated problem in need of a thorough legal framework.

Strategies like digital health, parents, families, education, and discipline have been shown to prevent cyberbullying in the metaverse. Training on bystander and bully-victim dual roles, coping skills, and interactive serious games were identified by Chen et al. (2022) as crucial components of successful digital health treatments to decrease bullying and cyberbullying. Small impact sizes on cyberbullying perpetration and victimization were identified in parent-related treatments (Wang & Jiang, 2022). However, interventions with a theoretical underpinning were shown to be more successful than those without one. Schools and families, as well as technology-based practices and an all-encompassing strategy, are central to most of the solutions identified by Tozzo et al. (2022) for preventing and responding to cyberbullying. Active and co-viewing parental mediation is more successful than restrictive parental mediation in protecting children from cyberbullying and accompanying psychopathological symptoms (Rega et al., 2022).

METHODOLOGY

Metaverse cyberbullying prevention requires numerous elements. The researchers began with a detailed literature review on cyberbullying in virtual settings like the metaverse. This study shows current understanding and causes of cyberbullying. Knowing the context helps create effective tactics and solutions.

A literature study identifies metaverse cyberbullying types. Recognizing metaverse technologies and services may help combat cyberbullies. After identifying its numerous forms, cyberbullying prevention may be targeted.

Data Collection

The data collection process involved conducting a comprehensive search in the Scopus database using the keywords "Cyberbullying" and "Metaverse." These keywords were selected to ensure a focused approach to finding relevant literature on the topic. The search was conducted in May 2023; the results were exported for further analysis.

Inclusion and Exclusion Criteria

To ensure the relevance and quality of the included literature, specific inclusion and exclusion criteria were applied. The focus was on publications written in English that addressed the phenomenon of cyberbullying in the metaverse. This criterion was chosen to align with the scope of the study and allow for a comprehensive analysis of the available literature.

Papers that did not directly address the primary concerns and research questions were excluded from the analysis. This selection process aimed to prioritize studies that provided insights into the causes, forms, and potential solutions to cyberbullying in the metaverse.

Data Analysis

The collected data, including the selected articles, were subjected to a thorough analysis to extract relevant information. A systematic approach was employed to review each article and identify key themes and patterns related to cyberbullying in the metaverse. The analysis involved synthesizing the findings, discussing the various forms of cyberbullying observed, and understanding the tools and resources available for countering cyberbullying incidents.

Identification of Cyberbullying Forms

Through the analysis of the literature, the different forms of cyberbullying prevalent in the metaverse were identified. These forms may include, but are not limited to, direct harassment, spreading rumors or false information, impersonation, exclusion, and hate speech. Understanding these various forms is crucial for developing targeted strategies to prevent and address cyberbullying incidents in virtual environments.

Exploration of Tools and Resources

Additionally, the analysis delved into exploring the tools and resources available within the metaverse to counter cyberbullying. This investigation aimed to identify existing features, policies, and technologies that can be leveraged to create a safer, more inclusive environment for users. Understanding the available resources allows for the development of effective prevention and intervention strategies tailored to the unique characteristics of the metaverse.

By conducting a comprehensive literature analysis and considering the identified forms of cyberbullying and available resources, this study establishes a foundation for the development of a comprehensive strategy to combat cyberbullying in the metaverse.

RELEVANCE AND SIGNIFICANCE OF TACKLING CYBERBULLYING IN THE METAVERSE WITH A PRESCRIPTIVE PERCEPTION OF GIS

Preventing and detecting cyberbullying in GIS, especially in the metaverse, is crucial. The consequences of cyberbullying can be severe, including emotional distress, social isolation, and suicide. Cyberbullying can also negatively impact the victim's mental health, school performance, and overall well-being (Olweus & Limber, 2018). In addition to the harm it causes individuals, cyberbullying can disrupt the experience of other users and decrease engagement, which can negatively affect the metaverse's economy and community.

The metaverse is a place for people to socialize, learn, and have fun. Thus, it should create a safe and welcoming environment for all users. However, the anonymity provided by the internet and metaverse can make it easier for cyberbullies to engage in harmful behavior. Victims may struggle to seek help; authorities may face barriers in holding bullies accountable (Gadekallu et al., 2022). Preventing and detecting cyberbullying in the metaverse with a prescriptive perception of GIS is crucial to ensure the well-being of users and the success of the virtual community.

Preventing and detecting cyberbullying in the metaverse can also serve as a model for addressing cyberbullying in other online spaces as the issues and challenges are similar. By addressing cyberbullying in the metaverse, we can also improve our ability to tackle cyberbullying in different contexts. Preventing and detecting cyberbullying in the metaverse is crucial to ensure that everyone can enjoy the benefits of the virtual world while feeling safe and respected (Oleksy et al., 2023). It is the responsibility of everyone involved, including individual users, virtual world operators, game developers, and community leaders, to take action to prevent cyberbullying.

Categorizing Potential Types and Behaviors of Cyberbullying in the Metaverse

A prescriptive view of GIS is needed to identify types of metaverse cyberbullying (fig 1) and design effective prevention and treatment techniques. Cyberbullying has diverse effects on victims and requires different reactions and solutions. Identifying varieties of cyberbullying may help people and communities learn how to recognize and react to it. It can also make the internet safer and more courteous for everyone. With a prescriptive view of the GIS, people need to know how to react to cyberbullying in the metaverse (Han et al., 2023). This section discusses metaverse cyberbullying.

Harassment and Threats: In-Game Chat and Private Messages

Unfortunately, abuse and threats are common in the metaverse. Cyberbullying may include verbal abuse, sexual harassment, and death threats through in-game chat and private messaging (Kumbhojkar & Menon, 2022; Murnion et al., 2018). Cyberbullying in the metaverse with a prescriptive GIS perspective is complicated by the internet's anonymity. Victims are unable to identify cyberbullies because they use fake identities and avatars. In fact, cyberbullies may become more violent or damaging due to their anonymity. Fortnite and Minecraft users have received death threats and/or racist and homophobic remarks (Di Pietro & Cresci, 2021). The ease of communication within the metaverse is another threat. Messages or posts can reach a huge audience in a short amount of time. This makes it hard for victims to avoid harassment or for authorities to locate the culprit.

People may feel more comfortable expressing their true feelings and emotions behind a computer screen; therefore, cyberbullying in the metaverse with a prescriptive perception of GIS can be more intense and personal than real-world bullying (Qamar et al., 2023). With a prescriptive GIS view, cyberbullying in the metaverse may be prevented by educating and encouraging users and/or providing reporting mechanisms.

Posting Embarrassing or Private Information Online

Cyberbullying has become a common form of online aggression. Its ability to spread rumors, make threats, or steal personal information can devastate a victim (Ybarra et al., 2007). Bullying in the metaverse has far worse repercussions. Imagine that you are a frequent user of the metaverse and have created a strong online community. You like collaborating with others and exploring this new digital frontier. One day, you find your personal information online without your consent. Your phone number, address, and name are now public. You may be surprised at first. Who could do this to you? However, the harm becomes apparent as reality sets in. Your privacy was grossly breached. Identity theft, financial fraud, and bodily violence may occur. Your reputation and emotional well-being may be irrevocably ruined (Solove & Citron, 2017). Unauthorized disclosure of sensitive information may have fatal implications. It may cause emotional, reputational, and bodily harm. We must avoid cyberbullying as more individuals explore the digital frontier.

Figure 1. Potential types of cyberbullying in the metaverse

Creating Fake or Doctored Images or Videos

The metaverse with a prescriptive GIS is the next frontier of social interaction and cyberbullying. Fake photos and videos are one form of cyberbullying. In this virtual environment, people may easily manipulate and exploit media to harass and shame others (Tyagi & Yadav, 2022). A metaverse user may construct a deep fake video of another person behaving inappropriately or saying things they would never utter. Photoshop may also make someone seem overweight, ugly, or unappealing. Cyberbullying may destroy the victim's emotional and social well-being and/or reputation. Cyberbullying may cause humiliation, embarrassment, and powerlessness, leading to social isolation and low self-esteem. Bullying's reputational impact may last a lifetime. Social media has made it easier for people to utilize doctored photos and videos to harass others in real life. Education and awareness help people comprehend how their behaviors affect others (Baccarella et al., 2018). GIS technology and rules should be used to identify and stop metaverse media manipulation.

Spreading Rumors and Lies

The metaverse blurs reality and fiction, letting the imagination run free. Human depravity exists in this virtual world. Social media, chat rooms, online gaming, and other virtual settings are used to distribute incorrect or inaccurate information (Carlyle & Steinman, 2007). This form of cyberbullying may cause mental pain, social isolation, and reputational harm. For instance, imagine a teen who loves gaming being cyberbullied because of her gender (Nesse, 1998; Quinn, 2017; Tandoc, 2019).

Proposition

Cyberbullying can be a devastating experience for anyone, but there are steps one can take to protect themselves and minimize the impact. One can change their username or avatar to avoid being identified by the bully. They can also remove personal information from their virtual profiles. One should also avoid responding to or engaging in rumors or lies, as it gives more attention and credibility to the bully. Instead, the user can try to confront the bully and ask them to stop spreading rumors or lies. If that fails, they can report the behavior to the game developer or virtual world operator and block the bully to prevent them from making contact. It is important to save any evidence of cyberbullying, such as screenshots or chat logs, to use as proof when issuing a report.

Victims should seek support from friends, family, or a professional counselor to cope and build a support network of friends and allies who can help counteract the rumors or lies. If the cyberbully could put one at risk of physical harm, do not hesitate to contact police. One does not have to face cyberbullying alone.

To address, detect, and prevent cyberbullying, virtual world operators, game developers, and community leaders should develop policies and procedures around the monitoring of chat, private messages, public posts, and gameplay. They can also provide resources for victims and act against those who engage in this behavior. Policies can be created to allow users to report and remove personal information shared without consent and implement technical solutions to detect and remove manipulated media. Educating users about the impact of rumors and lies on victims and the importance of fact-checking information before sharing it can also help prevent cyberbullying.

Prescriptive Perception on Addressing Mechanisms of Cyberbullying in the Metaverse

Cyberbullying directions are needed as the metaverse evolves in GIS. Cyberbullying may harm people and communities, thus effective techniques and tools are needed (Brown et al., 2006). We can establish a safer, more inclusive metaverse in GIS by offering clear advice and assistance for users, including educational campaigns, community-building activities, and policy enforcement. Instructions must be developed and implemented to protect people in this rapidly changing digital realm (Tamers et al., 2020). This section addresses metaverse cyberbullying with GIS prescriptivism.

Technical Solutions

Creative ways to protect individuals from cyberbullying are needed due to the metaverse's rise in cyberbullying. Technical solutions to cyberbullying include tools and methods (Topcu-Uzer & Tanrıkulu, 2018), which vary from automatic screening and moderation to advanced AI and machine learning algorithms. These tools check online material for hazardous or abusive content.

Filtering and Moderation Tools

Users need new techniques to protect themselves against cyberbullying in the metaverse. Filtering and moderating programs search online material for objectionable language, photos, and other harmful information (Jhaver et al., 2022). They automatically filter such information and mark it for human inspection, enabling moderators to act if needed. Filtering and moderating technologies are beneficial in chat rooms, message boards, and other metaverse platforms where users interact (Kiene et al., 2019). By removing hazardous information that might cause emotional discomfort and other psychological difficulties, these techniques can make the internet somewhat safer (Milosevic, 2016). Filtering and moderation should be combined with education, community development, and policy enforcement. Combining these tactics creates a metaverse-wide cyberbullying prevention strategy with a prescriptive GIS view.

Many content filtering and moderation technologies have been created to keep the internet safe and positive. These include language screening, picture censorship, chat log and message board monitoring, and user-generated content moderation. Language filtering automatically blocks hate speech, obscenity, and slurs (Xu & Zhu, 2010). Image moderation uses automated methods to recognize and eliminate photos with nudity, graphic violence, or other inappropriate material (Kowalski et al., 2014). Chat log and message board monitoring automatically flag potentially dangerous content for human assessment (Postigo, 2003). User-generated content moderation automatically flags potentially hazardous videos, audio, and photos for human review (Arsht & Etcovitch, 2018). These screening and moderating mechanisms keep online material suitable and polite for all users, providing a more inviting online environment (fig 2).

AI and Machine Learning

AI and machine learning have become significant weapons in the GIS cyberbullying battle. These automatic systems highlight hate speech and abuse in real time. AI and machine learning may also monitor chat logs, audio and video communication, and other user interactions to identify bullying tendencies and act (Ghosh et al., 2018). AI and machine learning can combat cyberbullying, but they are not a perfect answer. They should be used alongside education, community development, and policy enforcement. These tools must adapt to new kinds of cyberbullying, hate speech, and other

Figure 2. Cyberbullying combating mechanisms in the metaverse
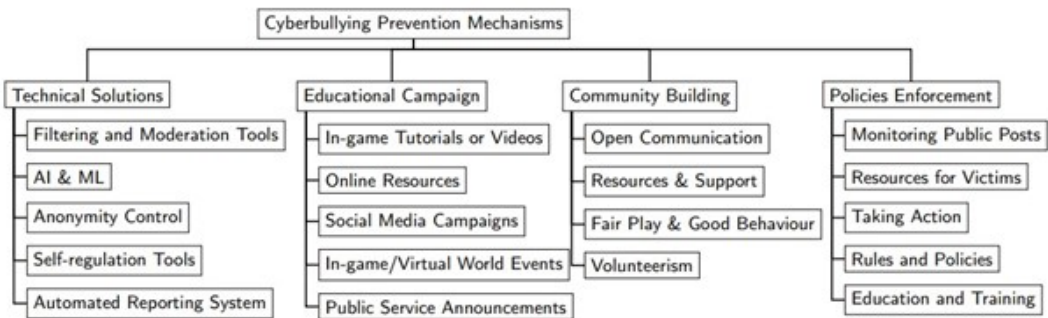
harmful behavior (Ransbotham et al., 2016). Thus, continuous updates and maintenance are necessary to counteract metaverse cyberbullying using a prescriptive GIS.

Advanced screening and moderation systems have been created to combat cyberbullying. Sentiment analysis features use natural language processing to analyze chat logs or message board postings for negative or damaging language that may signal bullying (Nikiforos et al., 2020). These features may flag material for human moderation. Behavioral analysis features employ machine learning algorithms to analyze user behavior, such as how often they engage with others or send messages, to identify bullying tendencies (Raisi & Huang, 2017). The features help moderators stop harassment and abuse in a timely manner. Voice and face recognition features employ AI and computer vision to identify bullying in voice chat and video conferencing (Westerlund, 2019). These characteristics may indicate targeted, threatened, or bullied individuals for additional consideration. Machine learning algorithms identify aberrant behavior patterns, such as a rapid surge in aggressive or bullying behavior, for evaluation (Xiang & Gong, 2008). Still, we must be watchful and build new methods to navigate the digital terrain.

Anonymity Control

Anonymity management may prevent metaverse cyberbullying in GIS, where online identities are generated in seconds. This type of system lets users select their anonymity, protecting them from cyberbullies. Users may regulate their online appearance and reduce risk by making educated privacy choices (Barth & De Jong, 2017). Anonymity control alone, however, cannot solve cyberbullying. Thus, education, community development, and policy enforcement are needed (Katz et al., 2014). We must educate consumers about the hazards and advantages of anonymity.

Online harassment may be prevented through various methods. Pseudonymity allows users to establish a unique username or avatar that does not expose their identity, making it harder for cyber bullies to find and harass a user in real life (Van der Nagel, 2017). Limiting personal information to age and location may also decrease the risk of cyberbullying (Rosenblum, 2007). Two-factor authentication, which requires users to verify their identity with a phone number or e-mail address, makes it harder for cyberbullies to create fake accounts and impersonate others (Petsas et al., 2015). Friend or group management allows users to determine who may read and interact with their profile, reducing cyberbullying and boosting security (Subrahmanyam & Greenfield, 2008).

Self-Regulation Tools

Cyberbullying within the metaverse has increased, necessitating new methods to safeguard users. Self-regulation technologies let users automate their online experience (Price et al., 2005). For instance, using features that mute, block, or report cyberbullies can empower and protect users. Still, self-regulation tools alone are not enough because they depend on users to report cyberbullying behavior. However, victims may not be aware of the tools or feel uncomfortable issuing a report (Milosevic et al., 2019).

Self-regulation techniques, education, community development, and policy enforcement should be employed to address cyberbullying. Encouraging and supporting cyberbullying reporting and response is essential. Cyberbullying can be prevented by working to make the internet safe and giving users a positive online experience.

As noted, various features and setting within a virtual platform can prevent metaverse cyberbullying. Mute features discourage cyberbullies from bothering players in-game or through private messaging (Alam et al., 2018). Users may restrict other users from accessing or engaging with their accounts (Fitzpatrick & Birnholtz, 2018). Users may report cyberbullying to game creators or virtual world operators (Ciucci & Baroncelli, 2014). Self-regulation options let users restrict communication with strangers, ban objectionable language, and establish age limits for contacts (Tambini et al., 2008). Virtual platforms in GIS empower users to govern their online experience and, in turn, combat cyberbullying.

Automated Reporting Systems

An automatic reporting system can easily safeguard users from online harassment (Chelmis & Yao, 2019). Users may automatically report cyberbullying using in-game or website reporting mechanisms, making it easier for virtual world operators, game creators, and community leaders to detect and handle any problems (Ashktorab & Vitak, 2016). Still, an automated reporting system does not solve all problems.

Users may report cyberbullying directly via the gaming interface, simplifying the reporting process (Reid et al., 2022b). Website reporting allows players to report cyberbullying outside of the game via a website or online form (Luxton et al., 2012). E-mail reporting features let users report cyberbullying via e-mail, which can be useful for users who cannot access the game or website to issue a report (Hon & Varathan, 2015). Automated response features allow the virtual world operator, game developer, or community leader to automatically acknowledge the report and provide information about the bullying. Virtual world operators, game creators, and community leaders can work to create a safer, more pleasant online environment by integrating reporting and reaction capabilities.

Educational Campaigns

Educational campaigns are effective strategies for addressing cyberbullying. Users can feel empowered to recognize and address cyberbullying behaviors. By educating users about the risks and consequences of cyberbullying, campaigns can promote a culture of respect and safety (Chadwick & Chadwick, 2014). They can also protect personal information and promote online privacy, helping users navigate the virtual world with confidence.

By understanding the value of reporting, as well as how to do so effectively, users can take control of their online experience. They can make the metaverse a more positive and inclusive place for all users. Educational campaigns, a crucial component of any effort to prevent cyberbullying in the metaverse, should also be used with other strategies. The following examples detail educational programs that can be utilized to stop cyberbullying in the metaverse with a prescriptive perception of GIS.

In-Game Tutorials or Videos

Cyberbullying prevention may be taught via in-game tutorials or videos. Incorporating lessons into the game or virtual environment can help users learn about cyberbullying and understand how to report harassment (Yoon, 2020). These tutorials should be readily understood by users of all backgrounds and technical abilities. Lessons should be regularly evaluated and updated to stay current:

- Interactive and engaging lessons may improve education. Interactive tutorials should employ entertaining quizzes or games to teach users about cyberbullying (DiFranzo et al., 2019). This technique is especially useful for younger users who have shorter attention spans.
- Scenario-based tutorials can teach users how to identify and report cyberbullying through real-life examples (Angafor et al., 2023). Realistic experiences help consumers learn how to react to cyberbullying.
- Short movies can illustrate the impact of cyberbullying, increase awareness, and teach viewers how to protect themselves and others (Shah et al., 2019). Videos that show the emotional toll of cyberbullying may inspire empathy.
- Immersive cyberbullying education with in-game characters or avatars is also possible (Schwarz et al., 2020). Users can learn about cyberbullying while playing educational games.

Online Resources

Users need access to cyberbullying prevention information as the metaverse grows. Online resources can be placed within the game or the virtual world website (Calvo-Morata et al., 2020). These

materials should be available to everyone, regardless of background or technical skill (Wang et al., 2000). Updates and evaluations can keep the materials current. Online safety and respect should be promoted, providing users with the means to defend themselves and others through digital resources and educational campaign about metaverse cyberbullying.

- Help centers can explain cyberbullying methods, ways to recognize cyberbullying, and how to report harassment (Kaluarachchi et al., 2020). The centers also assist victims with accessing support or frequently asked questions (Willard, 2007).
- Users may discuss cyberbullying and get assistance through online forums or chat rooms (Lai et al., 2017).
- Hotlines and support groups connect harassed users with organizations that aid victims (Robinson & Maines, 2008).

Social Media Campaigns

Social media campaigns can provide information about cyberbullying and how to detect or avoid harassment (Williams & Pearson, 2016). Advertising should be participatory and encourage users to discuss their experience. They should be inclusive and accessible to many types of users. As cyberbullying evolves, these initiatives must be evaluated and improved (Shankar et al., 2022). Social media campaigns should encourage respect, empathy, and compassion in the metaverse, preventing cyberbullying and encouraging pleasant online interactions:

- Hashtag campaigns raise awareness about cyberbullying and encourage users to share their experiences. Shared stories can build a community, offer education, and provide supportive environments (Calvin et al., 2015).
- Infographics raise awareness of cyberbullying, teaching users how to protect themselves and others (Fediy et al., 2021).
- Live chats or Q&A sessions discuss cyberbullying and teach users how to protect themselves and others (Milosevic, 2018).
- Social media personalities can promote an online campaign to reach larger audiences. These influencers can engage followers to educate people about the impacts of cyberbullying (Ouvrein et al., 2021).
- Virtual world operators, game creators, and community leaders can user their position to raise awareness about cyberbullying.

In-Game or Virtual World Events

The metaverse can educate users about cyberbullying through in-game or virtual world events in GIS. These events might include workshops, seminars, and webinars on hazards and prevention methods related to cyberbullying (Bote, 2021). Events should be accessible to individuals of all backgrounds, ethnicities, and technological abilities. Users may also engage with others, form communities, and exchange cyberbullying experiences. Like other methods, events must be updated on a regular basis (Dinakar et al., 2012):

- Workshops, seminars, webinars, and in-game rallies may educate players about the impact of cyberbullying and solutions to avoid or address these actions (Jacob, 2014).
- Virtual rallies can include speeches, performances, and interactive activities about cyberbullying prevention (Chisholm, 2014).
- Workshops and seminars can help users recognize and report cyberbullying (Ang, 2015; Beale & Hall, 2007).
- On-demand webinars are easy to attend (Topor & Budson, 2020).

Public Service Announcements (PSAs)

There are multiple metaverse notification systems that can enhance awareness about cyberbullying. For example, PSAs can educate users about the dangers of cyberbullying (Amarah et al., 2020). PSAs should be interesting and accessible to all users regardless of background, culture, or technological skill (Mergel & Bretschneider, 2013). PSAs can also discuss online privacy guidelines. PSAs must be updated and evaluated on a regular basis:

- Notification channels can include website alerts, pop-ups, banners, or in-game ads that focus on metaverse cyberbullying awareness (Whitby, 2011).
- Cyberbullying information may be shared on social platforms like Facebook, Twitter, and Instagram (Klauck et al., 2017).
- In-game and virtual billboards can alert users about the impacts of cyberbullying (Burrows & Blanton, 2016).

Community Development

Guidelines and Norms

Anonymity is common within the virtual world. Therefore, it is key for metaverse platforms to set up guidelines and norms that foster a respectful, empathetic community that encourages courteous user interactions (Anshari et al., 2022). Community development includes forums and chat rooms where members can connect through shared interests and positive dialogue (Barab et al., 2001). In turn, the digital platforms can deter cyberbullying and promote healthy social interactions through welcoming environments.

Open communication fosters a community through in-game chat and message boards that help gamers feel more comfortable and understood (Godwin-Jones, 2014). Safe platforms allow individuals to discuss their experiences without judgement or reprisal (McStay, 2022). The mental health of cyberbullying and harassment victims may benefit from these platforms because they are welcoming and foster open conversations.

It is likely that users will socialize and form communities in virtual worlds. Virtual meetings provide a secure atmosphere, allowing users to talk and join in conversations (Gorini et al., 2008; Seraj, 2012). Moderated conversations or debates promote the courteous and respected expression of perspectives and understanding (DeSanctis et al., 2003). Through shared stories, users can learn to recognize and report cyberbullying on virtual networks (Rachoene & Oyedemi, 2015). A feedback system may encourage users to report virtual issues or problems, which then assists in the detection and resolution of cyberbullying (Nocentini et al., 2015).

Online Support

Resources and support can also counter the impact of anxiety, depression, and social isolation caused by cyberbullying. Metaverse platforms may aid victims by providing mental health specialists and cyberbullying support groups or additional tools (Ngo et al., 2021; Su et al., 2022). Cyberbullying victims may report incidences to moderators or police via these virtual platforms. Virtual counsellors, chatbots, and other in-game services may aid cyberbullying victims (Reid et al., 2022a). Victims may get information and help via hotlines, support groups, websites, blogs, and online forums (Barak & Grohol, 2011). Victims may also access assistance and guidance through virtual or in-person support groups (Parris et al., 2012). Safety initiatives like these demonstrate to the user that the platform prioritizes cyberbullying and supports victims.

In-game or virtual world events, social media campaigns, and online resources can educate the community about cyberbullying and ways to support victims (Kintonova et al., 2021). An easy-to-use and accessible reporting mechanism may also help victims report cyberbullying without fear. Virtual platforms can assist cyberbullying victims with these tools and support systems.

Fair Play

Fair play and good behavior can combat cyberbullying (Cassidy et al., 2013). Metaverse platforms should encourage fair play by prohibiting cyberbullying and trolling. Platforms can reward good behavior by offering in-game rewards or recognition, incentivizing positive behavior and sending a message to the community that good behavior is valued (Park & Kim, 2022; Sewell, 2020). To encourage courteous behavior, platforms might provide online etiquette courses and cyberbullying prevention resources.

A gaming or virtual world code of conduct can also encourage fair play, learn about cyberbullying, and receive information on how to report harassment (Wu et al., 2021). Promoting good behavior and rewarding users who behave can foster a culture of respect and empathy (Barlin´ska et al., 2018; Pless & Maak, 2004). Promoting the advantages of the virtual world may generate a positive atmosphere and deter harmful behavior (Bullingham & Vasconcelos, 2013). Online etiquette education and cyberbullying prevention may also encourage good behavior (Huda et al., 2017; Rice et al., 2015). In addition, it is necessary to ban users who participate in cyberbullying or other undesirable behavior.

THEORETICAL AND PRACTICAL IMPLICATIONS

This section presents metaverse cyberbullying detection solutions when the problem persists. Virtual world operators, game developers, and community leaders should have clear policies and procedures to address and prevent cyberbullying, ensuring that cyberbullies are punished (O'Moore et al., 2013).

Virtual platforms may impose policies to stop metaverse cyberbullying. Moderators may warn, suspend, or ban cyberbullies. Users may report cyberbullying via in-game features or online forms (Balci & Salah, 2015). AI and machine learning can identify and stop cyberbullying in real time through the platform. These technologies can detect cyberbullying by analyzing user behavior and language, enabling moderators to act before the harassment worsens.

Monitoring Public Posts

Policing metaverse cyberbullying requires the monitoring of public postings. Virtual world operators, game creators, and community leaders should monitor in-game chat, message boards, and social media to detect and resolve cyberbullying. Moderators who spot cyberbullying in public messages can issue warnings or suspensions (Blumenfeld & Cooper, 2010). Monitoring public postings promotes respect and empathy among users. In turn, users are more likely to follow community rules and participate in a positive manner if they know they are being watched (Fischer & Reuber, 2011). Platforms can offer users resources that promote respect and positive messaging messages (Akram & Kumar, 2017).

Automated filters, human moderation, community moderation, data monitoring and analysis, and proactive efforts are needed to avoid metaverse cyberbullying. Automated filters may search public postings for cyberbullying keywords or phrases, flagging potentially harmful or improper information for review (Gongane et al., 2022). Human moderators analyze reported material and then act on cyberbullying. In community moderation, users report cyberbullying and a human moderator analyzes the material (Bhandari et al., 2021). Data on public postings, such as flags and cyberbullying complaints, is needed to identify patterns and advise policy (Howell & Burruss, 2020).

Resources for Victims

Policy enforcement against metaverse cyberbullying includes victim resourcing, which provides resources to cope with and avoid harassment (Bastiaensens et al., 2019). These types of assistance and tools may assist cyberbullying victims in addressing sadness, anxiety, and suicide (Helfrich et al., 2020). Virtual platforms can provide victims with counselling, hotlines, and assistance on banning, muting, and reporting negative behavior. Cyberbullying victims may also access extra support through

third-party organizations, including online safety, mental health, and law enforcement authorities (Kim et al., 2021).

Games and virtual worlds can provide users with virtual counsellors, chatbots, and other support systems. Hotlines, support groups, websites, blogs, and forums may also help the victims (Ortiz & Khin Khin, 2018). In-game or virtual events, social media campaigns, and online resources can offer education on cyberbullying (Diamanduros et al., 2008). A cyberbullying reporting system may help victims cope with and avoid future incidents (Lowry et al., 2016).

Take Action

The metaverse needs strict cyberbullying laws and consequences (Hinduja & Patchin, 2013). Platforms may warn, suspend, or prohibit cyberbullies. Cyberbullies may be prosecuted by both platforms and police. Platforms should promote safety and positivity (Mukherjee & Nath, 2007). Policy enforcement against metaverse cyberbullying, therefore, requires action.

Proactive solutions include banning cyberbullies from games or virtual worlds and suspending or deleting accounts of such users (Ringland et al., 2015). Notifying parents or guardians of cyberbullies might spotlight the detrimental effects of their child's behavior and provide solutions to address the problem (Pyzalski et al., 2022). Cyberbullies may face criminal penalties for cyberstalking, harassment, or hate speech.

Rules and Policies

It is vital to create and implement appropriate metaverse cyberbullying policies. Enforced standards that outline prohitibed behaviors and their repercussions may help users minimize cyberbullying (Bauman, 2007). As noted, platforms could teach online etiquette, bringing awareness to a respectful online culture (Jagatheesaperumal et al., 2022). Platforms can also monitor user behavior and enforce cyberbullying policies by appointing moderators to monitor machine learning and AI tools that detect real-time cyberbullying (Almomani et al., 2022; Brdesee, 2022; Dan, 2022; Li et al., 2022).

Users must have a code of conduct, including resources on fair play (Burton & Mutongwizo, 2009). As noted, virtual world owners and community leaders should suspend, restrict, or revoke the accounts of cyberbullies (Feinberg & Robey, 2009). To keep up with developments and community requirements, cyberbullying policies must be reviewed and updated on a regularly basis (Marczak & Coyne, 2010).

Education and Training

Moderators are essential in enforcing regulations, monitoring user behavior, and combating cyberbullying (Trabelsi et al., 2022). Therefore, they must be trained through online or in-person seminars to recognize harassment, hate speech, and trolling (Mkono, 2018; Piscatelli & Lee, 2011; Sandars et al., 2020). Complaints and responses should follow clear standards (Corcoran & McGuckin, 2014). The work of highly skilled moderators will impact the online community, increasing respect and empathy among users.

Other cyberbullying professionals (i.e., psychologists, counsellors, and lawyers) can be used to assist moderators (Doumas & Midgett, 2021). Moderators may also deal with emotionally taxing materials. Thus, they should be given tools and support on self-care.

CONCLUSION AND FUTURE DIRECTIONS

As GIS continues to expand and evolve, the prevalence of cyberbullying in the metaverse has become a major concern for all stakeholders. The immersive nature of the metaverse allows users to interact in previously unimaginable ways, creating a new set of challenges. Cyberbullying in the metaverse can take on various forms, including harassment and trolling. These acts can have severe emotional

and psychological effects on the victims. Therefore, addressing this issue requires a comprehensive and collaborative effort from metaverse operators, users, and law enforcement agencies.

Establishing a culture of respect and responsible behavior is essential. This includes educating users on how to identify and report cyberbullying. It also requires clear guidelines on acceptable, appropriate conduct in the virtual space. This can be achieve by implementing community standards and policies that discourage cyberbullying and encourage positive interactions.

It is crucial to raise awareness about the potential harms of cyberbullying in the metaverse. User should expect and receive a supportive, inclusive environment.

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