Metaverse Ethics from The Perspective of Metaverse and Ethics: A Bibliometric Analysis*

Metaverse ve Etik Perspektifinden Metaverse Etiği: Bibliyometrik Bir Analiz

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Abstract

The metaverse is an innovative digital environment that aims to offer immersive experiences to consumers by integrating virtual and physical worlds. By providing opportunities across various fields, it enhances interaction levels, facilitates access to information, and improves service quality. However, it is anticipated that the metaverse will also bring about issues related to privacy, confidentiality, data security, and ethics. In particular, personal data collected within metaverse environments and the sensitivities associated with privacy are considered significant ethical risk areas. In this context, the ethical issues arising from the metaverse have increasingly become an important field of academic research. This study analyzes 388 academic publications published between 2008 and 2025 in the Web of Science (WoS) database that jointly address metaverse and ethics, using bibliometric analysis with the R and VOSviewer program. The research findings indicate that academic interest in metaverse and ethics has increased markedly, especially since 2022. In terms of publication and citation counts, China, the United States, and the United Kingdom are identified as leading countries, while China and the United States stand out in international academic collaborations. In addition, concepts such as virtual reality, artificial intelligence, data privacy, security, and ethics are found to be at the core of metaverse research. This study reveals the current academic structure of the metaverse and ethics field and provides a guiding perspective for future research on metaverse ethics.

Keywords: Metaverse, Ethics, Metaverse Ethics, Metaverse Technologies, Bibliometric Analysis

Öz

Metaverse, sanal ve fiziksel dünyaları birleştirerek tüketicilere sürükleyici deneyimler sunmayı amaçlayan yenilikçi bir dijital ortamdır. Birçok alanda sunduğu olanaklarla etkileşim düzeyini artırmakta, bilgiye erişimi kolaylaştırmakta ve hizmet kalitesini yükseltmektedir. Bununla birlikte, metaverse gizlilik, mahremiyet, veri güvenliği ve etik sorunları da beraberinde getireceği öngörülmektedir. Özellikle metaverse ortamlarında toplanan kişisel veriler ve bu verilere ilişkin mahremiyet hassasiyetleri, etik açıdan önemli risk alanları olarak değerlendirilmektedir. Bu bağlamda, metaverse'nin ortaya çıkardığı etik sorunlar akademik araştırmalar açısından giderek daha önemli bir çalışma alanı haline gelmiştir. Bu çalışma, metaverse ve etik konularını birlikte ele alan ve Web of Science (WoS) veri tabanında 2008–2025 yılları arasında yayınlanan 388 akademik yayını bibliyometrik analiz yöntemiyle R ve VOSviewer programı kullanarak analiz etmektedir. Araştırma bulguları, metaverse ve etik konularına yönelik akademik ilginin özellikle 2022 yılından itibaren belirgin biçimde arttığını göstermektedir. Yayın ve atıf sayıları açısından Çin, Amerika Birleşik Devletleri ve İngiltere'nin öncü ülkeler olduğu, uluslararası akademik iş birliklerinde ise Çin ve ABD'nin öne çıktığı tespit edilmiştir. Ayrıca, sanal gerçeklik, yapay zeka, veri gizliliği, güvenlik ve etik kavramlarının metaverse araştırmalarının merkezinde yer aldığı belirlenmiştir. Bu çalışma, metaverse ve etik alanındaki mevcut akademik yapıyı ortaya koyarak, gelecekte metaverse etiğine yönelik yapılacak araştırmalar için yol gösterici bir perspektif sunmaktadır.

Anahtar Kelimeler: Metaverse, Etik, Metaverse Etiği, Metaverse Teknolojileri, Bibliyometrik Analiz.

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1. INTRODUCTION

The emergence of a new concept or technological development can have broad and unpredictable impacts not only within the field in which it originated but also across various other sectors. Through the butterfly effect, a technological innovation or new environment can initially create effects that appear limited in scope, but over time, these effects can reverberate significantly across various fields. Metaverse technology exemplifies this dynamic, drawing considerable interest from industry, academia, the media, and the public. It has influenced the strategic planning processes of numerous companies worldwide (Wang et al., 2022). It has become a central focus of academic research. In addition to the major waves of technological innovation driven by the internet, mobile technologies and personal computers, a fourth transformative wave has now emerged, fueled by spatial and immersive technologies such as virtual reality or augmented reality. This advancement has accelerated the evolution of Metaverse technologies (Mete, 2022). The Metaverse is expected to have the capacity to radically reshape not only individual experiences and social interactions but also the structural and operational dynamics across a wide range of industries (Rathore, 2023). It is also expected to establish a significant presence in various sectors and offer significant market opportunities. It has been noted that the Metaverse has started to be used in a wide range of fields, particularly marketing, retail, tourism, sports, healthcare, fashion, education, real estate, and commerce (Jeong et al., 2023; Nalbant, 2021; Habiboğlu and Karabıyık, 2023). It is expected to see further development in many sectors, particularly fashion, management, marketing, and education (Rathore, 2023).

The metaverse appears to have a structure that can create sector-specific opportunities and can be used in many sectors in terms of both production and consumption (Özenir, 2022). Marketing, adapting to consumer and market dynamics, is expanding its activities in areas such as digital, mobile, and e-commerce, as well as venturing into emerging technologies and platforms (Karakuş, 2019; Grewal et al., 2020). It is anticipated that conducting marketing activities in the Metaverse will become increasingly important for brands (Nalbant & Aydın, 2024; Khatri, 2022). As with other digital platforms, the desire of brands and businesses to interact with the Metaverse is transforming consumer behavior, shaping competition through a new channel (Wang et al., 2023). Businesses seeking to adopt blue ocean strategies have begun taking strategic and planned steps to conduct marketing campaigns in the Metaverse. Bibliometric techniques are widely used in the literature that systematically addresses the Metaverse in various fields such as education, health

and tourism (Bizel, 2023; Rejeb et al., 2023; Mutlu Avinç and Yıldız, 2024). Studies that have used bibliometric analyses to investigate the metaverse cover a wide range of disciplines such as education (Bizel, 2023; Panda et al., 2024; Akhil et al., 2024), tourism (Asif et al., 2025; Prados Castillo et al., 2024), health (Damar & Koksalmis, 2024; Nguyen & Voznak, 2024), business (Piñeiro-Chousa et al., 2025), agriculture (Marcuta et al., 2023), supply chain management (Johnpaul, 2024; Fernando et al., 2025), economics (Tunçsiper et al., 2025), architecture (Mutlu Avinç & Yıldız, 2024) and sustainable development and sustainability (Tiwari & Srivastava, 2024). In this context, it is clear that academic papers on the metaverse have increased significantly in recent years, both in number and diversity. In particular, studies using bibliometric analyses to examine trends, collaborations, and conceptual structures in the literature have gained importance (Yaseen et al., 2024; Shukla et al., 2023; Abbate et al., 2022; Damar, 2021). However, the fast-paced development of the metaverse extends beyond technological and socio-economic dimensions, giving rise to ethical discourses and debates. The increasing number of academic studies addressing the relationship between the metaverse and ethics from a holistic perspective (Yasuda, 2024; Benjamins et al., 2023) emphasizes the need for comprehensive academic research on the subject.

On the other hand, bibliometric analyses, widely used in the social sciences, are also receiving increasing attention in marketing research (Zeren & Kaya, 2020). In particular, the innovations and impacts of the metaverse on marketing practices have led to the emergence of bibliometric studies focusing on this concept in recent years (Yaseen et al., 2024; Shukla et al., 2023; Abbate et al., 2022; Çelik et al., 2022; Damar, 2021). However, a lack of bibliometric research has been observed that addresses the concept of ethics, a frequently discussed concept in the context of technological advancement, together with the metaverse. This points to a significant gap in the literature regarding the examination of research trends at the intersection of the metaverse and ethics, particularly through bibliometric indicators such as country, author, and citation analysis. In this context, the core purpose of this paper is to conduct a bibliometric analysis of studies that simultaneously address the concepts of the metaverse and ethics based on a comprehensive search of the WoS database. The publications that examine these two concepts in conjunction are analyzed from a holistic perspective, and the scientific outputs in this domain are systematically investigated using bibliometric methods. The study visualizes and elaborates on the conceptual development, research trends, and focal areas within the relevant literature. A comprehensive bibliometric analysis approach is employed through the use of the R programming language, the Bibliometrix package, and the VOSviewer software during the analysis process.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Metaverse can be defined as the integration of elements from the physical world into digital environments, enriched with virtual reality technologies, and the convergence of spaces that exist entirely in digital form (Collins, 2008). This digital construct enables users to simulate real-life experiences within a three-dimensional environment (Aburbeian et al., 2022). The Metaverse is considered a virtual world where digital and physical environments merge, allowing individuals to interact with each other and their environment regardless of physical spatial limitations (Toraman, 2022; Narin, 2021). In recent years, the rapid advancement of immersive technologies, particularly virtual reality and augmented reality, has significantly increased academic and industrial interest in the Metaverse (Duan et al., 2021; Arpaci et al., 2022; Kaplan and Haenlein, 2009). Technologies that are more compatible with everyday life, especially augmented reality (AR), are thought to contribute to a deeper integration of the Metaverse into daily experiences and positively impact the user experience (Gao et al., 2024).

In Metaverse environments, highly sensitive and comprehensive personal data can be collected, including not only demographic information but also facial expressions, eye movements, voice data, and behavioral patterns. This situation raises significant ethical concerns regarding data privacy and security (Efendioğlu, 2023; Koca & Tunçay, 2022). Furthermore, the proliferation of immersive technologies associated with the metaverse has the potential to alter individuals' perceptions of reality, thereby giving rise to a range of ethical and social concerns, including technology addiction, psychological disturbances, and societal detachment (Akyüz & Gülten, 2023; Yoo et al., 2023; Lee, 2021).

The concept of ethics, as an integral part of social life, has been the subject of discussion across various fields throughout history and continues to be evaluated in every new and/or different context in which a community and everyday life exist (Emrem, 2022). Ethics refers to the principles of right conduct that guide the decisions of institutions and individuals (Madhani, 2016). Acting in accordance with the principles and norms that shape attitudes and behaviors in specific situations forms the foundation of ethical understanding (Mucuk, 2017). In this regard, the development of ethical sensitivity fosters the emergence of ethical behavior (Whysall, 2000). As technological developments continue to progress rapidly, ethical debates surrounding their implications have become increasingly prevalent (Bitirim Okmeydan, 2017). Emerging digital technologies and environments such as the internet, social media, artificial intelligence, augmented reality, virtual reality, blockchain, and the metaverse are raising numerous ethical concerns, ranging from individual privacy and data security to digital identity and online behavior. While issues such as information reliability, cyberbullying, and digital manipulation are ethically debated on social media platforms, broader discussions across the internet focus on data privacy, algorithmic fairness, and equitable access. For instance, Erdoğan & Gürbüz (2025), in their study on the manipulation of algorithms in digital environments, highlight that algorithms possess the potential to shape consumer behavior through the targeted delivery of products and services, thereby creating a basis for ethically questionable practices. Furthermore, emerging technologies such as the metaverse and artificial intelligence are increasingly being examined through ethical frameworks, particularly with regard to user rights, virtual ownership, digital well-being, and broader societal implications (Elliott & Soifer, 2022; Nair et al., 2022; Arcia et al., 2023; Mitrushchenkova, 2023; Antón et al., 2010; Madden et al., 2013; Walker et al., 2024). From this perspective, digitally evolving environments driven by technological advancements have become highly relevant and critical areas of ethical research. In today's rapidly advancing digital world where individuals can easily access technological innovations ethical issues inevitably arise. However, the accelerating pace of digitalization often surpasses the ability of existing policies, regulations, and ethical guidelines to adapt to such rapid change. This gap contributes to the increased visibility of moral dilemmas and ethical challenges within digital environments. One of the prominent domains where these ethical debates have become particularly concentrated is the metaverse (Noyan & Özpençe, 2023).

As digital environments become increasingly immersive, traditional legal systems face significant challenges in regulating activities within the metaverse. Unlike the traditional internet, which can be applied to identifiable entities, the decentralized and pseudonymous nature of the metaverse complicates legal oversight and enforcement (Chen, 2025). While ethical research on the metaverse has not yet been consolidated into formal legal regulations, it has begun to be discussed in academic circles in light of ethical concerns and concerns (Chen, 2025; Qin et al., 2025). Studies conducted within the context of marketing activities within the metaverse have shown that this new technological environment, where brands offer more interactive and immersive experiences, poses various ethical challenges for consumers. Key ethical concerns identified in the literature include consumer privacy and security in the metaverse (Özdemir et al., 2024; Lu and Mintz, 2023; Smith et al., 2023), issues related to digital

identity (Arcia et al., 2023; Mitrushchenkova, 2023), and trust and security issues (Al-Kfairy et al., 2023; Tukur et al., 2023; Wang et al., 2023).

3. METHOD

3.1. Research Objectives and Significance

The Metaverse is designed to create an interactive environment by combining physical and virtual spaces, transforming into an ecosystem where brands, businesses, and various industries engage in marketing activities. This environment is envisioned as a comprehensive structure where purchasing behaviors occur, encompassing domains such as entertainment, science, education, and finance. However, as with any technological construct, ethical issues have begun to be discussed within the metaverse context. Issues such as security and privacy constitute key components of ethical discussions; accordingly, it is observed that academic circles have begun to explore proposals concerning how ethical principles can be implemented and maintained within the metaverse environment. In this context, the primary aim of the study is to carry out a bibliometric analysis of 388 academic publications that simultaneously address the concepts of the metaverse and ethics, published in the Web of Science (WoS) database between 2008 and 2025. Within the scope of the study, *"Distribution of Publication by Years, Three-Field Plot, Co-Occurrence Keywords Analysis, Tree Map, Words Frequency Over Time, Citation Analysis, Analysis of International Academic Collaboration, Institutional Collaboration Network Analysis, Co-Authorship Network Analysis, Distribution of Publication, Thematic Map Analysis"* are analyzed to reveal the structural and conceptual development of the relevant literature. This study is limited to articles published in journals indexed in the Web of Science database, which is widely recognized internationally and considered a prestigious source for academic research (Tekin et al., 2021). All publications examined in this study are in English. Based on the research questions proposed by Wang et al. (2023) to guide bibliometric analyses, these questions have been adapted to the scope of metaverse and ethics in line with the purpose of the study:

RQ₁: How have the publication trends of academic studies on the metaverse and ethics evolved over the years?

RQ₂: What are the most frequently used keywords in the metaverse and ethics literature, how are these concepts clustered, and how have these themes changed over time?

RQ₃: Which studies, authors, and journals receive the most citations in the field of metaverse and ethics, and which topics do these citations highlight in the literature?

RQ₄: Which countries, institutions, and researchers stand out in terms of international collaborations in the field of metaverse and ethics?

RQ₅: What are the motor, basic, niche, and emerging themes in the metaverse and ethics literature, and how are the relationships among these themes structured within the field?

3.2. Bibliometric Analysis Approach

In recent years, there has been a noticeable increase in the number of systematic reviews and bibliometric studies, driven by advancements in information and communication technologies and the growing ease of access to information via the internet (Yılmaz, 2021; Umut Zan, 2012). The growing popularity of bibliometric analyses which quantitatively and structurally examine scientific publications has been driven by the increased accessibility and usability of specialized software such as *Gephi, Leximancer, and VOSviewer*, as well as the advancement of scientific databases like Web of Science. Moreover, the expansion of bibliometric methodology beyond information science into other disciplines such as business research has further contributed to its widespread application. All these developments have led to a noticeable increase in academic interest in bibliometric analysis in recent years (Donthu et al., 2021). Quantitatively assessing scientific and technological progress using bibliometric methods allows comparison of developments in specific specialized fields against global standards or national institutions (Umut Zan, 2012).

Bibliometric analysis is a valuable method for interpreting large volumes of unstructured data using detailed techniques, enabling the discovery and mapping of cumulative scientific knowledge and evolutionary patterns across academic fields. Bibliometric studies can therefore provide a solid foundation for the innovative and meaningful advancement of a given field. By examining the social and structural connections between key research elements, such as authority networks, countries, and institutional affiliations, bibliometric analysis provides a systematic overview of a discipline's bibliometric patterns and underlying intellectual framework (Donthu et al., 2021). Bibliometric studies offer the opportunity to statistically analyze existing literature by examining variables such as citation counts, authorship, subject matter, countries, or publication types (e.g., books, articles). Furthermore, this analytical approach allows for the investigation of interest in a particular scientific field, trends related to specific

topics within that field, and changes in these trends over time (Zeren and Kaya, 2020; Umuz Zan, 2012; Garfield et al., 1978). In other words, bibliometric analyses statistically evaluate data such as authors, topics, citations, keywords, institutional and national affiliations, and scientific quality indicators to create a comprehensive framework of the relevant discipline (Kaya & Dinçer, 2023; Al & Tonta, 2004). Such analyses not only reveal the development and transformation of a research field over time but also help identify emerging topics and trends within the field. Such analyses offer researchers the opportunity to: (i) obtain a comprehensive overview, (ii) identify knowledge gaps, (iii) generate new research ideas, and (iv) strategically position their intended contributions within the academic landscape (Donthu et al., 2021).

3.3. Data Collection and Analysis Process

In this study, the Web of Science (WoS) database was selected due to its provision of access to high-quality, peer-reviewed academic publications and its frequent use as a reliable source in previous research (Chavarro et al., 2018). In the second stage of the study, appropriate keywords were selected and employed in the search process to comprehensively identify the relevant body of literature. Accordingly, the following search query was formulated to retrieve publications aligned with the aim of the study:

TS = ("*metaverse*" OR "*metaverse marketing*" OR "*metaverse technology*" OR "*metaverse applications*" OR "*metaverse platforms*" OR "*metaverse ethics*" OR "*metaverse governance*" OR "*ethics in metaverse*") AND TS = ("*ethic*" OR "*ethics*" OR "*ethical issues*" OR "*ethical concerns*" OR "*moral implications*" OR "*data privacy*" OR "*consumer privacy*" OR "*privacy protection*" OR "*personal data*" OR "*consumer protection*" OR "*digital ethics*" OR "*AI ethics*" OR "*social responsibility*" OR "*corporate responsibility*" OR "*information security*" OR "*data governance*" OR "*digital trust*")

and these keywords were searched within the 'Topic' field. One of the main reasons for using these keywords is to enable a broader perspective in reviewing studies conducted in the context of the metaverse and ethics. This is because the literature addresses not only general ethical principles, but also topics such as data privacy, information security, trust, and consumer privacy within an ethical framework (Fernandez & Hui, 2022). As a result of the WoS query, a total of 388 studies published between 2008 and 2025 were retrieved.
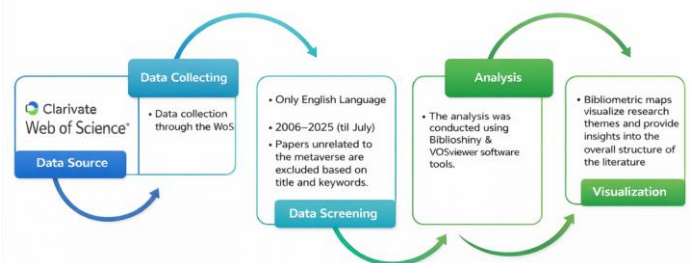

Figure 1: Data Collection Process

The use of the concepts of metaverse and ethics in combination within the Web of Science (WoS) database dates back to 2008. The literature comprising a total of 388 studies published between 2008 and 2025 that include both 'metaverse' and 'ethics' was analyzed using bibliometric methods. During the analysis process, the Bibliometrix package, developed for the R programming language and operated through the Biblioshiny graphical interface, was employed (Aria & Cuccurullo, 2017). For visualization and network construction, the VOSviewer software was utilized (Baker et al., 2020; Khan et al., 2020; Van Eck & Waltman, 2009).

Web of Science (WoS) supports a wide range of uses, from researchers' daily search and discovery activities to the provision of analytical datasets for bibliometric partners and exclusive access to raw data. WoS is not merely a catalog of academic publications; it is a curated, structured, and balanced database built on high-quality selection standards. Citation links between publications are comprehensively tracked, and detailed metadata are provided for each record. As such, WoS serves as a reliable, comprehensive, and versatile resource that meets the diverse information needs of researchers (Birkle et al., 2020). In addition to indexing academic publications, the WoS database also offers numerous bibliometric indicators such as citation counts and impact factors that enable the quantitative analysis of scholarly output (Grzybowska & Awasthi, 2020). Moreover, the Web of Science (WoS) database was chosen due to its provision of access to high-quality, peer-reviewed academic publications and its frequent use as a reliable source in previous research (Birkle et al., 2020). These reasons justify the preference for using WoS. The analysis applied in this study was conducted using the Bibliometrix package, an open-source library developed in the R programming language for bibliographic analysis, graphical visualization, and the interpretation of results (Göktaş & Boyraz, 2025).

During the analysis process, Biblioshiny, the graphical user interface of the package that allows operations without the need for coding, was utilized. In bibliometric data analysis, it is common to use one or more bibliometric or statistical software tools (Aria & Cuccurullo, 2017). In addition,

VOSviewer software was employed to create visualization networks (Van Eck & Waltman, 2010). Both tools are among the most widely and effectively used software in bibliometric data analysis (Baker et al., 2020).

4. FINDINGS

In this study, academic publications that include both the keywords "metaverse" and "ethics" in the Web of Science database were identified and analyzed using bibliometric methods. Based on the data obtained, the study reveals how the topics of metaverse and ethics have been addressed in the academic literature, which countries and institutions have taken the lead in this area, and which themes have emerged as prominent within the literature.

4.1. An Overview of The Data

Table 1 provides a comprehensive summary of the basic bibliometric indicators for academic publications indexed with the keywords "metaverse" and "ethics" between 2008 and 2025. Each cell represents a specific bibliometric metric, offering insights into trends in the literature, the intensity of research activity, and levels of scholarly productivity.

Table 1: General Information About Research Publications

CATEGORY	VALUE
Essential Data Information	
Time Span	2008:2025
Sources (Journals, Books, etc.)	274
Documents	388
Annual Growth Rate (%)	26,85
Average Document Age	1,44 yıl
Average Citations per Document	10,36
References	21697
Document Content	
Keywords Plus (ID)	489
Author Keywords (DE)	1476
Authors	
Authors	1412
Single-Authored Document Authors	56
Author Collaboration	
Single-Authored Documents	60
Co-Authors per Document	4,2
International Collaboration (%)	36,34
Document Types	
Article	314
Book Chapter	2
Conference Paper	72

Between 2008 and 2025, 388 documents on metaverse and ethics were analyzed from 274 sources (journals, books, and conferences). *Annual growth rate*: 26.85%; rising academic interest. *Average document age:* 1.44 years ; field is new and emerging. *Citations:* 10.36 per document, with 21,697 references in total. *Keywords:* 489 (Keywords Plus) and 1,476 (Author Keywords)

;multidisciplinary scope. *Authors:* 1,412 researchers; 56 authors produced 60 single-authored works. *Collaboration:* 4.2 co-authors per paper; 36.34% international collaboration. *Document types:* 314 journal articles, 72 conference papers, 2 book chapters. Overall, the field is rapidly growing, highly collaborative, and largely journal-driven.

4.2. Distribution of Publications by Year

Figure 2 presents the annual distribution of international studies published between 2008 and 2025 with the keywords "metaverse" and "ethics," based on data from the Web of Science (WoS) database.
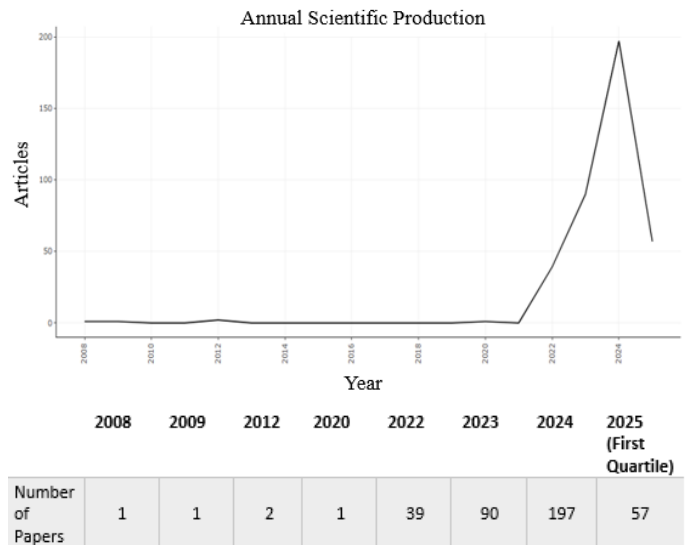

	2008	2009	2012	2020	2022	2023	2024	2025 (First Quartile)
Number of Papers	1	1	2	1	39	90	197	57

Figure 2: Distribution of Publications by Year

In Figure 2, a graphical representation is provided of the number of publications per year that address the concepts of "metaverse" and "ethics" together in the Web of Science (WoS) database. The number of publications on metaverse and ethics shows an upward trend over the years. It is observed that there were no studies prior to 2008 that jointly considered these two concepts. Between 2008 and 2021, the number of publications remained limited and the growth rate was slow, indicating that the intersection of metaverse and ethics had not yet gained substantial attention in academic circles. However, in 2022, a notable increase in publications can be observed, coinciding with the global acceleration of digitalization and the growing interest in the metaverse. During this period, the rapid advancement of technology and the heightened awareness of ethical issues led to a surge in academic research in this area. In particular, the broader acceptance of the metaverse and the intensification of debates surrounding digital ethics in 2022 encouraged more scholarly output on the subject. This surge continued into 2024, resulting in a significant concentration of publications. Based on current trends, it is

expected that the number of studies on metaverse and ethics will continue to rise in 2025 and beyond. In conclusion, the increasing interest in these topics in recent years has enabled scholars to explore the subject in greater depth, marking the beginning of an important period for future research in this domain. The findings reveal a significant increase in academic interest in the combined coverage of "metaverse" and "ethics," particularly since 2022, and suggest that this upward trend is likely to continue in the coming years. This indicates that as the metaverse becomes more widespread, its ethical dimension is also gaining increasing importance as a

research problem within academic circles (Smith et al., 2023).

4.3. Three-Field Plot

Depending on the purpose of the study, a three-field plot that visualizes the relationships among academic journals, research topics, sources, countries, authors, and other factors can reveal valuable insights through the analysis of three interconnected elements (Munim et al., 2020). The three-field plot is a bibliometric visualization generated using the Biblioshiny application.
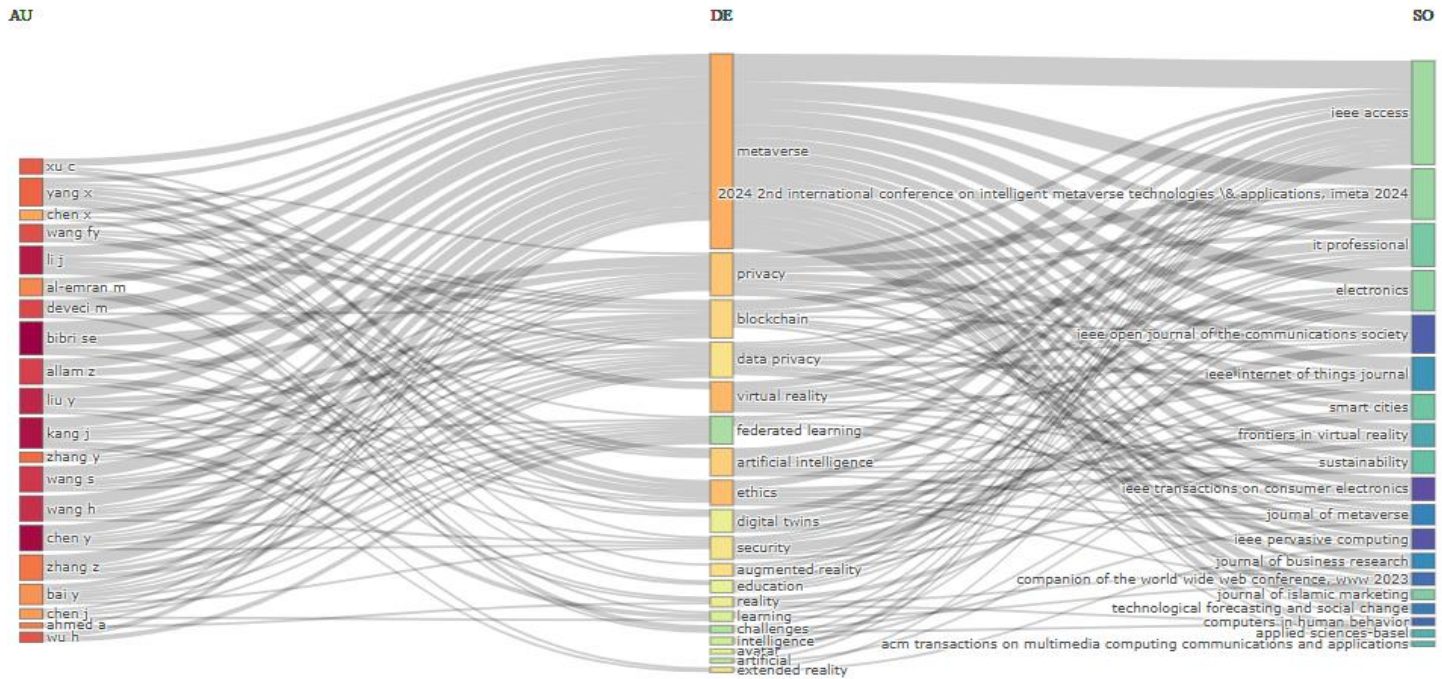

Figure 3: Three-Field Plot

The diagram visually presents the relationships within scientific production in a three-field structure by illustrating which thematic areas authors focus on and in which academic journals these studies are published. In the three-field Sankey diagram shown, the first column represents authors (AU), indicating those who have published the most or are highly influential in the relevant research area. Prominent figures in this section, such as Kang, J., Zhang, Z., Chen, Y., Li, J., Bibri, S., and Yang, X., are notable for their high publication volumes and contributions across diverse themes. This may encourage interested researchers to follow these authors more closely. The central column displays keywords that represent the primary research themes within the field, thereby establishing thematic links between the authors on the left and the publication sources on the right. For instance, terms such as "metaverse," "virtual reality," "data privacy," "blockchain," "artificial intelligence," and

"ethics" reflect key focal points in recent studies centered around digital technologies. Likewise, journals such as IEEE Access, Electronics, Journal of Communication Society, and Internet of Things Journal appear to be frequently preferred publication outlets for research on these topics.

4.4. Co-Occurrence Keyword Analysis

Keywords act as brief indicators and encapsulations of a manuscript's central themes and subject matter (Wang et al., 2025). By utilizing the VOSviewer and Bibliometrix software packages, this study conducted a co-occurrence keyword analysis to identify research trends in the domains of metaverse and ethics. The analysis incorporated thematic mapping, burst detection of keywords, and timeline visualizations to determine the hotspots, frontiers, and emerging trends in scholarly work addressing these subjects. Keyword analysis involves examining the terms selected by authors in academic articles to understand their thematic focus and to detect trending research topics (Pesta

et al., 2018). Co-occurrence keyword analysis examines the relationships between keywords that are frequently used together in scientific articles. It reveals how various concepts or topics are interconnected. Through this method, the core knowledge components (such as themes or concepts) of a scientific or technical field, as well as how these components are organized, are mapped out (Radhakrishan et al., 2017).
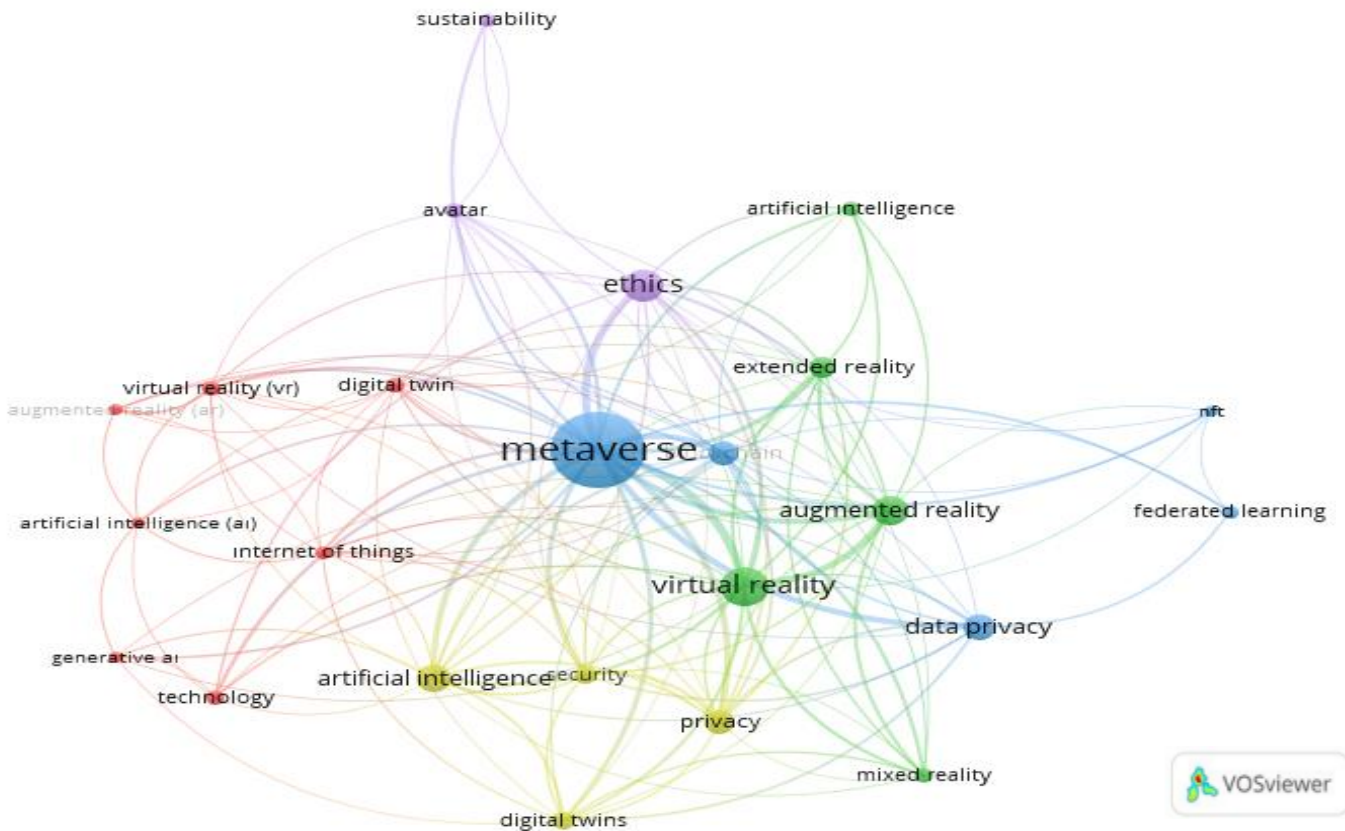

Figure 4: Visualization of The Most Frequently Used Co-Occurring Keywords

Figure 4 presents a visualization based on the criterion of keywords that appeared at least twice, aiming to enhance the interpretability of keyword connections. To display clusters more cohesively, a minimum of five items per cluster was set, resulting in a total of 21 clusters. According to the findings, the keyword "*metaverse*" emerged as the most frequently occurring term, appearing 193 times. This highlights its central role in the research landscape. The second most frequently occurring keyword is "*virtual reality*" with 52 occurrences, followed by "ethics" with 38 occurrences. Additionally, keywords such as "*artificial intelligence*", "*blockchain*", "augmented reality", "mixed reality", "augment reality", "technology", "Internet of Things (IoT)", "digital twin", "NFT" are frequently associated with the metaverse. Ethical concerns are also reflected in the co-occurrence of terms such as "privacy," "security," and "data privacy."

The prominence of the keyword "metaverse" confirms its pivotal position in the literature and reflects the high level of scholarly interest. The high visibility of "virtual reality"

and "ethics" indicates that ethical and technological dimensions are being addressed jointly within metaverse-related research. Furthermore, the frequent co-occurrence of "ethics" with keywords like "privacy", "security" and "data privacy" suggests that scholars are particularly focused on the ethical issues posed by metaverse technologies especially in terms of data protection and cybersecurity. These findings underscore that metaverse research prioritizes not only technical advancements but also ethical and societal considerations.

4.5. Most Frequent Words

In the bibliometric analysis of studies conducted in the context of the metaverse and ethics, the most frequently used terms are visualized through the "Most Frequent Words" graph generated by the Biblioshiny application. This graph displays the terms most commonly used by researchers in the examined literature and provides valuable insights into the key concepts that dominate the field.
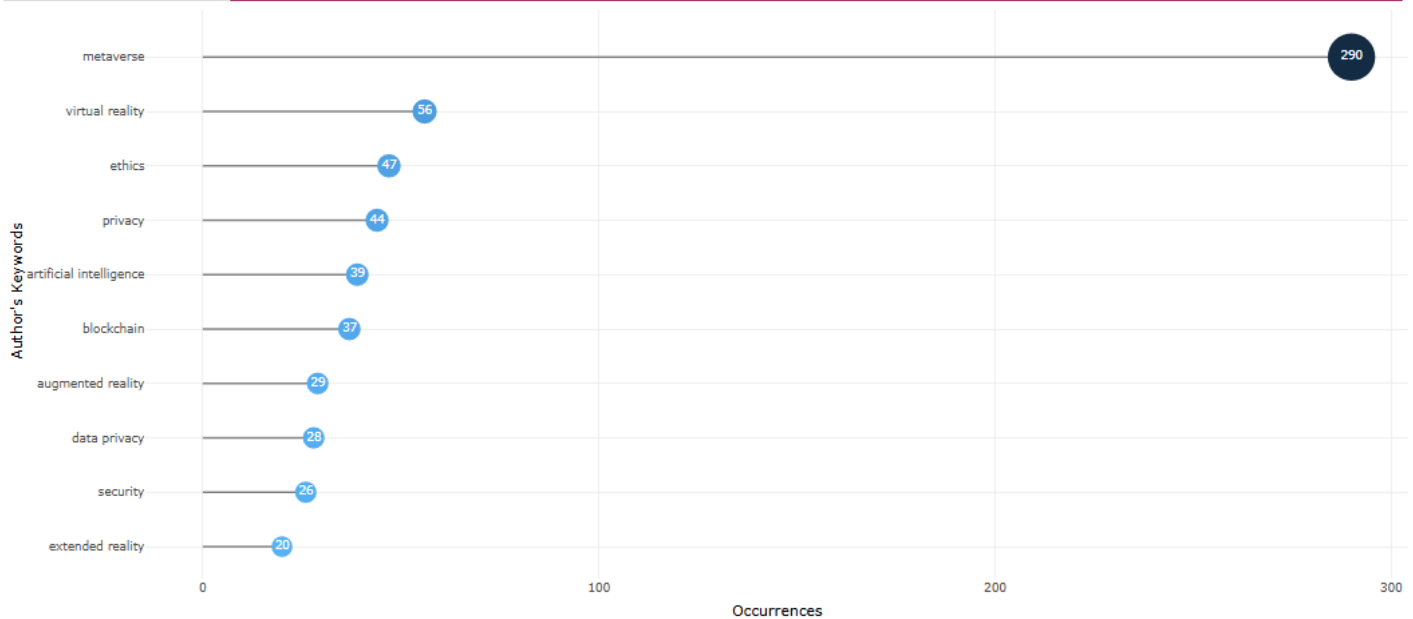
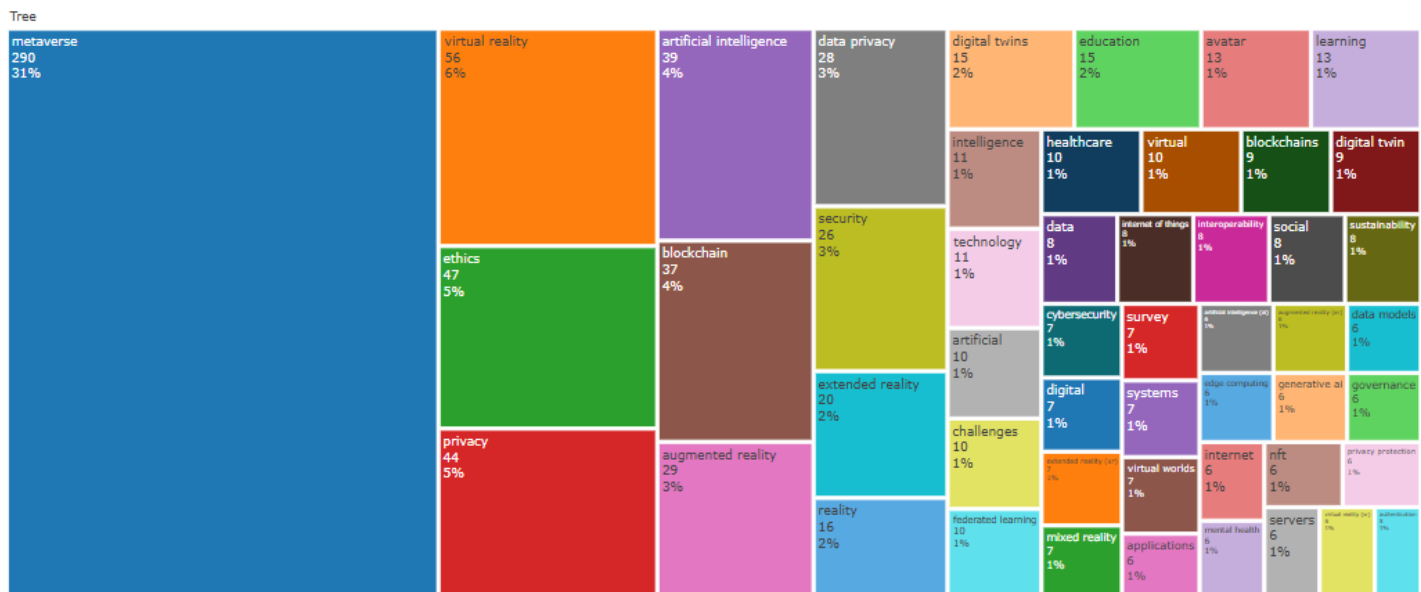**Figure 5:** Most Frequent Word Chart

Figure 6: Tree Map

Figure 5 illustrates the frequency of the most commonly used author keywords across the analyzed corpus. It is evident that "metaverse" overwhelmingly dominates the dataset with 290 occurrences, highlighting its central focus within the reviewed literature. Following this, terms such as "virtual reality" (56), "ethics" (47), "privacy" (44), and "artificial intelligence" (39) appear with significant frequency, indicating their prominent role in metaverse-related research. The presence of keywords like "blockchain" (37), "augmented reality" (29), "data privacy" (28), and "security" (26) further emphasize the interdisciplinary nature of the field, encompassing technological advancements and critical concerns surrounding data protection and cybersecurity. The relatively lower frequency of "extended reality" (20)

suggests emerging or more niche topics within this research domain. Overall, the keyword distribution reflects a research landscape deeply engaged with both the technical underpinnings of the metaverse and the accompanying ethical and privacy issues, underscoring the multifaceted challenges and considerations that scholars address in this evolving area.

4.6. Tree Map

This mapping model not only explains the frequency counts of the keywords but also provides their percentage distributions within the entire dataset (Marlina, 2025).

This map in Figure 6 is a tree map that displays the proportions and numerical distributions of the most frequently used author keywords in the analyzed literature

using colored boxes. Each box represents the total frequency of a particular keyword as well as its percentage share within the overall dataset: *(i) The largest blue box corresponds to the keyword "metaverse," which appears 290 times and accounts for 31% of the total, indicating that the metaverse is the dominant theme in the research.(ii) The keyword "virtual reality" is shown in orange and appears 56 times (6%), followed by "ethics" (green, 47 times, 5%), "privacy" (red, 44 times, 4%), and "blockchain" (brown, 37 times, 4%). (iii) Other noteworthy keywords include "artificial intelligence" (purple, 39 times, 4%), "augmented reality" (light brown, 29 times, 3%), and "data privacy" (light purple, 28 times, 3%).* This tree map visually illustrates that metaverse research is a multidisciplinary field encompassing both technology-driven core concepts and social-legal dimensions such as ethics, privacy, and security. The relative size of each keyword clearly reflects the areas where research efforts are most concentrated.

4.7. Words' Frequency Over Time

It refers to a type of analysis or graphical representation that shows how often certain words or terms have been used over a period of time.
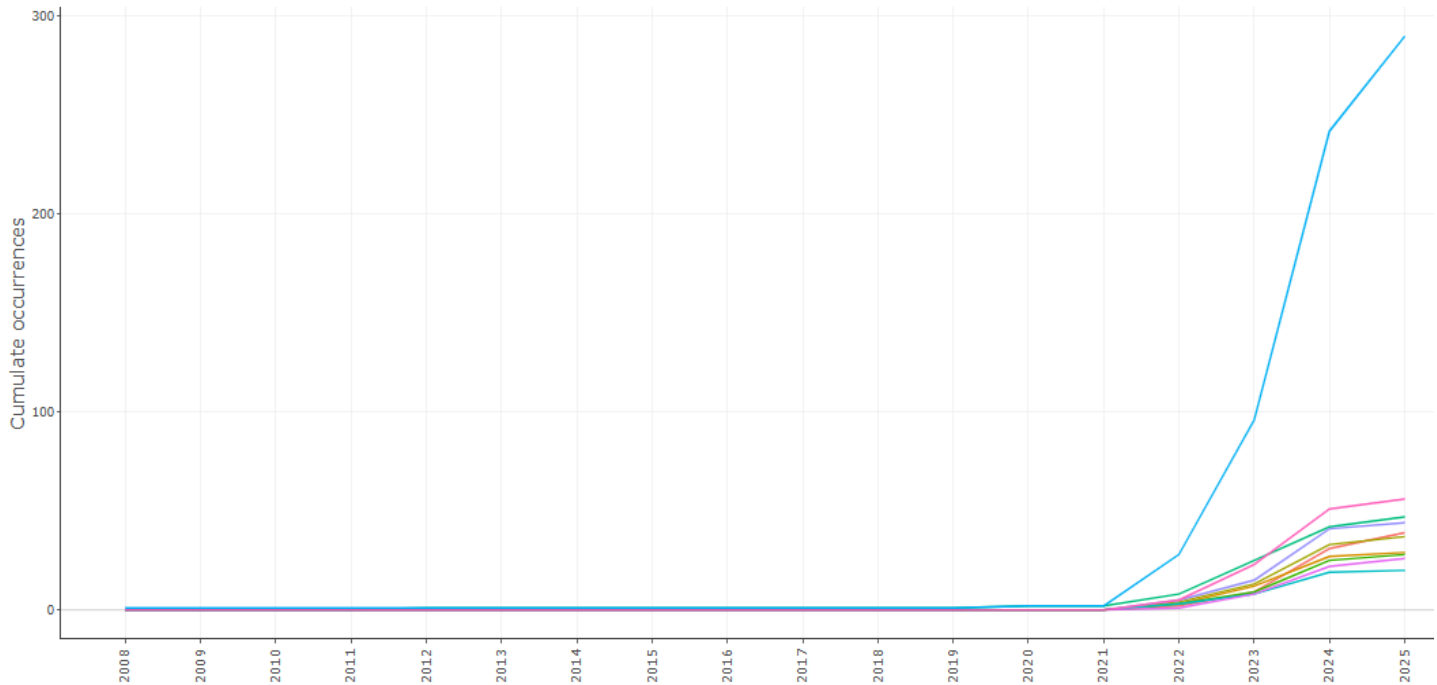

Figure 7: Keyword Frequency Timeline

According to the keyword analysis covering the years 2008–2025, the term "metaverse" emerged as one of the earliest appearing and fastest-growing concepts in the literature. While it was used only once or twice per year from 2008 to 2021, its frequency increased significantly in subsequent years—28 times in 2022, 96 times in 2023, 242 times in 2024, and 290 times in 2025—indicating that it has become a central focus of research during this period. This surge can largely be attributed to the growing public and academic interest in the metaverse following Meta's rebranding announcement in 2021 (Koca & Tunçay, 2022). Similarly, the year 2022 marked a turning point in the literature, with the emergence of many technological and social keywords. For example, the term "immersive" began to rise rapidly after 2022 and reached a frequency of 56 in 2025. This indicates a growing academic interest in immersive technologies alongside the rise of the metaverse (Karakuş, 2024).

The term "ethics" gained significant momentum starting in 2022 and was used 47 times by 2025. This increase reflects the growing discussion of the ethical, moral, and social impacts of metaverse environments. Terms related to privacy, such as "privacy" and "data privacy," have similarly seen increasing interest since 2022, appearing 44 and 28 times respectively by 2025. This trend highlights the growing importance of data security and personal privacy issues within metaverse environments (Karakuş, 2024). Similarly, technological concepts such as artificial intelligence, blockchain, and augmented reality have shown a remarkable increase since 2022. In particular, blockchain was mentioned 37 times in 2025, reflecting growing interest in the digital economy and secure digital ownership associated with the metaverse (Yuan & Yang, 2022). Additionally, topics like security and extended reality have also rapidly gained presence in the literature after 2022, appearing 26 and 20 times respectively by 2025. Overall, these data indicate that since 2022, metaverse research has

expanded beyond technological innovations to encompass multidisciplinary dimensions including ethics, privacy, data security, and artificial intelligence.

4.8. Citation Analysis

Citation analysis refers to the examination of bibliographic references made between scientific studies (Nicolaisen, 2007). In other words, it facilitates the identification of the most productive researchers and the most frequently cited sources within a specific academic field. It also provides valuable insights into the continuity of knowledge by assessing how long sources remain influential and relevant in the literature (Al & Tonta, 2004). In bibliometric research, citation analysis of countries is

conducted to evaluate the scientific productivity, impact, and international collaborations of different nations (Nam & tutar, 2023).

In this context, an analysis was carried out to reveal citation relationships among countries and to determine which countries are the primary producers of publications. The study applied a threshold criterion: a country must have produced at least one publication that received at least one citation. Based on this threshold, 72 out of 82 countries in the dataset met the criteria and were included in the analysis. Figure 8 presents the results of this evaluation based on citation counts and publication productivity across these 72 countries.
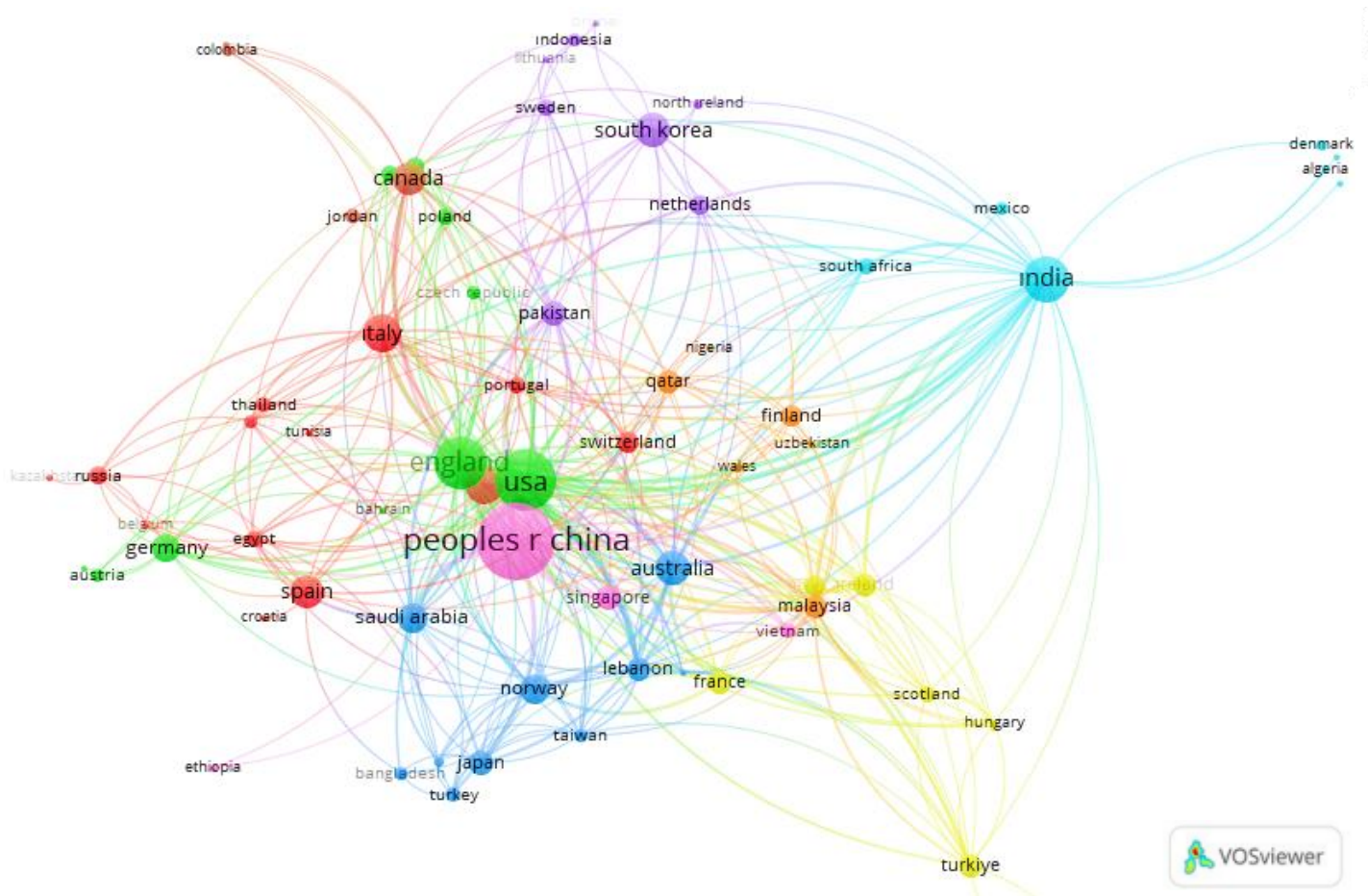

Figure 8: Visualization of Countries' Citation Networks

According to the results of the citation analysis presented in Figure 8, China, the United States, and the England emerge as the leading countries in terms of scientific impact. China ranks first with a total of 1,047 citations, followed by the United States with 1,023 citations and the England with 876 citations. These countries also stand out as the top three in terms of total link strength, indicating their prominence not only in citation counts but also in the intensity and strength of their scientific collaborations

with other countries. Total link strength reflects the extent of international academic cooperation, revealing the degree to which countries are integrated into the global scientific network.

4.9. Analysis of International Academic Collaboration

Analysis of International Academic Collaboration aims to reveal the intensity, scope, and structure of joint publications and scientific cooperation between different countries. With the widespread use of the internet and the

diversification of communication channels, researchers conducting studies on similar topics in different countries now have more accessible opportunities to collaborate on joint research (Al & Sezen, 2012).
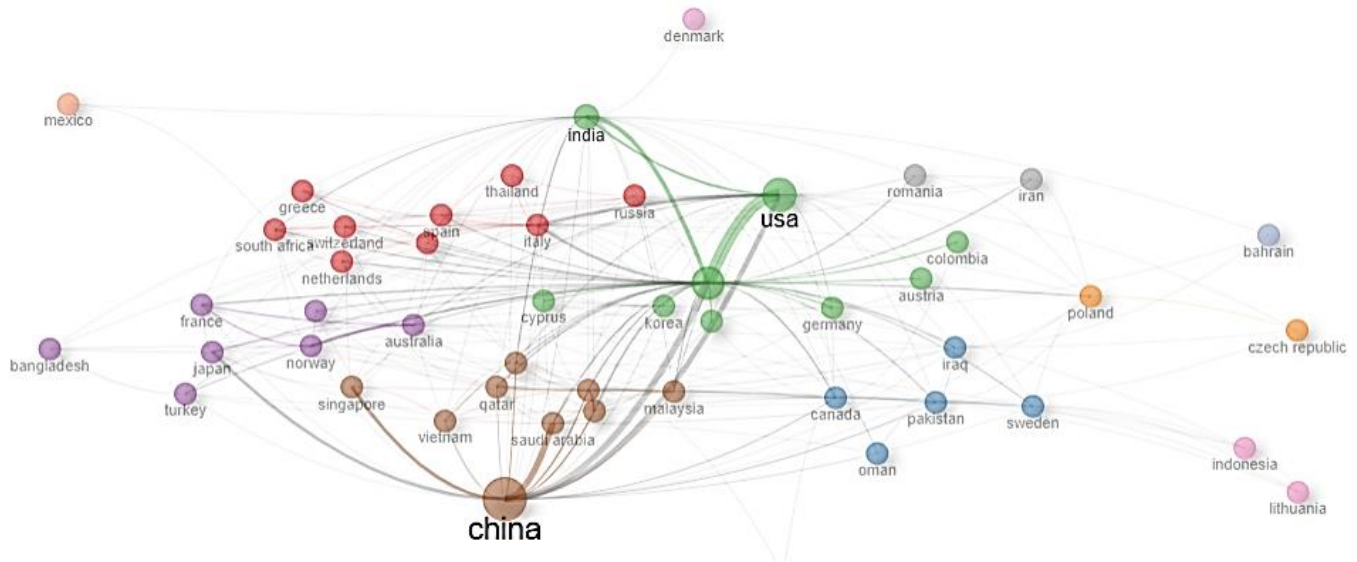

Figure 9: Map of International Academic Collaboration

In Figure 9, China, the United States, and India emerge as the largest nodes within the network, playing a central role and standing out as key actors in international co-authorship. These countries function as "hubs," integrating many other countries into their collaborative networks and thus acting as catalysts for the rapid dissemination of scientific knowledge. On the other hand, countries such as Mexico, Denmark, and Lithuania are positioned at the periphery of the collaboration network, exhibiting more limited engagement in terms of international co-publications and total link strength. This suggests that these countries have relatively lower participation in the global academic networks concerning metaverse and ethics and maintain more restricted levels of scientific

4.10. Institutional Collaboration Network Analysis

Network analysis visualizes patterns of scientific collaboration and citation relationships, revealing interactions among institutions and researchers across different geographic regions. Such analyses allow the identification of institutions that hold a central position meaning they are more influential and strongly connected within national or international collaboration networks (Acar, 2025).
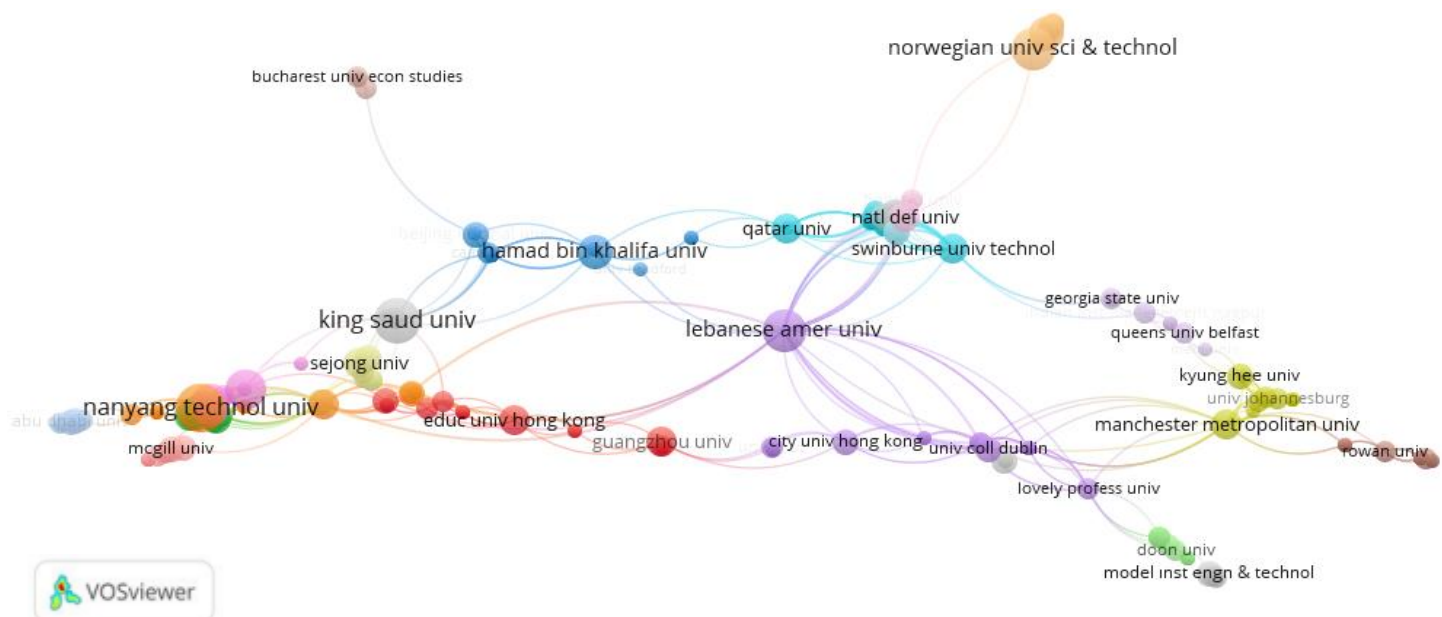

Figure 10: Collaboration Networks of Research Institutions

The institutional collaboration network map presented in Figure 10 illustrates the central and regional distribution of international academic partnerships among universities. The map reveals that institutions such as Lebanese American University, Hamad Bin Khalifa University, and King Saud University occupy central positions within the network, establishing strong collaborations with numerous universities and acting as key agents in the flow of scientific knowledge. In particular, Lebanese American University serves as a bridge by connecting universities from different geographical regions. Other institutions, such as Nanyang Technological University, stand out as regional hubs within their own clusters. In contrast, universities such as the Norwegian University of Science and Technology and the Bucharest University of Economic Studies appear at the periphery of the map, indicating a more limited level of collaboration. These findings suggest that scientific production and knowledge exchange tend to be concentrated in certain hubs, while some universities and research institutions maintain a more marginal role in international academic collaboration networks.

4.11. Co-Authorship Network Analysis

It is well known that the number of authors in scientific publications varies across disciplines. In recent years, there has been a notable increase in multi-authored publications, and in some fields, single-authored studies have become increasingly rare (Al, 2005). This shift is primarily due to the growing interdisciplinary nature of research topics. As many subjects now require expertise from multiple fields, researchers are compelled to collaborate, making multi-authored publications inevitable (Al et al., 2012). A network map was constructed based on co-authorship relations to identify the most collaborative and highly connected authors. This analysis applied a threshold requiring at least one publication and one citation. According to the results of the co-authorship network analysis in the context of metaverse and ethics, authors with no links to others were excluded from the network map. As shown in Figure 11, the findings reveal ten distinct clusters. Among these, the cluster with the highest link density is highlighted in red. Within this group, authors who play a central role in the collaboration network are represented by larger nodes.
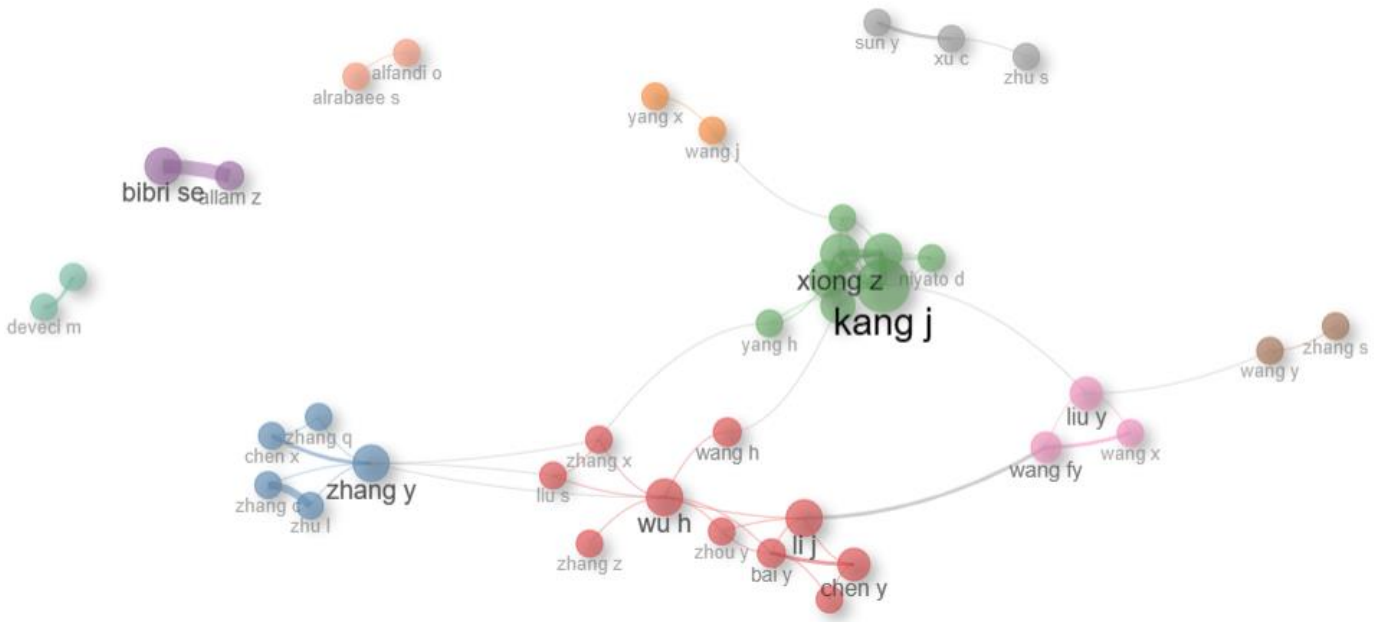

Figure 11: Co-Authorship Network

As shown in Figure 11, Kang J., Bibri et al., Zhang et al., Li, J. & Chen, Y etc. are among the leading authors in the field of metaverse and ethics. These authors stand out not only for their individual contributions but also for the research teams they have formed. Figure 6 visualizes the co-authorship network among these researchers, indicating that the teams led by Kang J., as well as Niyato and Dusit, have the most extensive publication networks. Ultimately, this network map reveals that collaboration and citation relationships among authors are concentrated in specific clusters. Some authors (e.g., "Kang J" and "Zhang et al.")

occupy central positions within the network and emerge as key actors in the collaboration structure.

4.12. Distribution of Publications

The analysis results related to the journals publishing studies that simultaneously address the topics of metaverse and ethics are presented in Figure 12. This analysis identifies the journals with the highest number of publications in the field and also provides data on their total link strength and citation counts. Accordingly, the findings reveal which journals are most actively involved in metaverse and ethics

research. These insights are intended to guide researchers in conducting literature reviews and selecting appropriate publication platforms. Based on the analysis of 388 publications indexed in the Web of Science (WoS) database that cover both metaverse and ethics, Figure 12 illustrates the publication distribution map and highlights the top 10 most active and influential journals or conference proceedings in this research domain:
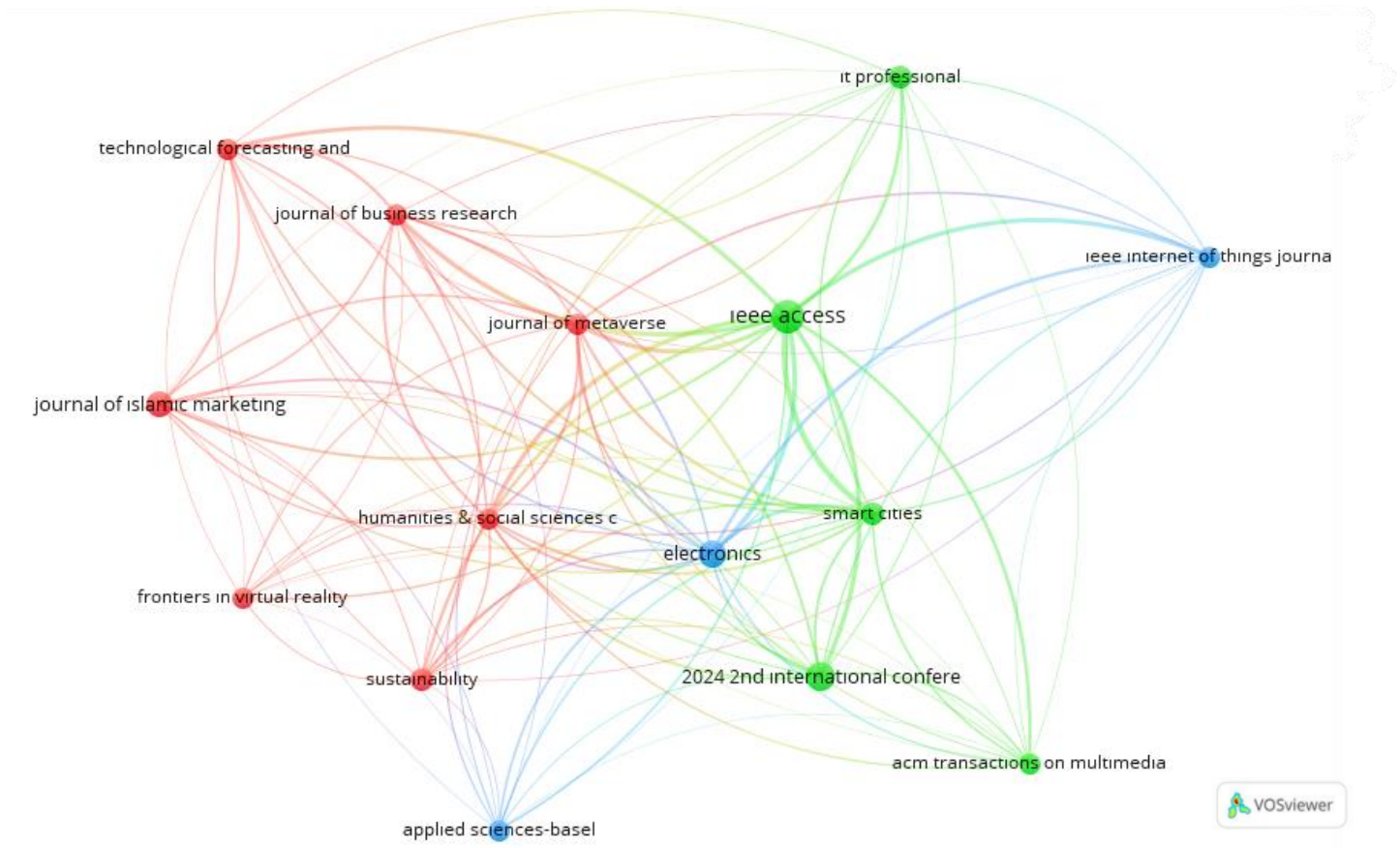

Figure 12: Publication Distribution Map

According to the publication distribution map presented in Figure 12 and based on the VOSviewer analysis, IEEE Access emerges as the journal with the highest number of publications on the topics of metaverse and ethics. With a total of 10 articles, 89 citations, and a high total link strength of 595, IEEE Access demonstrates its central role both in publication volume and network strength. The second most productive source is the 2024 2nd International Conference on IoT, contributing 8 publications with a total link strength of 176. Electronics ranks third, offering 7 articles and accumulating 35 citations with a total link strength of 255, indicating its notable influence in the field. Journal of Islamic Marketing is ranked fourth with 6 publications, 28 citations, and a total link strength of 116. Although its network strength is relatively modest, the journal plays an important role in broadening the scope of the field. In fifth place is Smart Cities, which, with 5 publications, has accumulated a remarkable 366 citations and a total link strength of 280—

showcasing its significant citation impact relative to the number of publications. This diversity underscores the interdisciplinary nature of the topic and its relevance across a broad spectrum of academic fields.

4.13. Thematic Map Analysis

Thematic mapping is a tool used in bibliometric analyses. This tool clusters scientific publications and articles based on similar keywords and topics. It visually reveals the relationships and connections between the publications of a given study (Özğan & Aluçlu, 2023). By employing thematic map analysis, the literature is examined to identify the conceptual structure by determining the concepts, topics, and themes around which existing studies are shaped (Yay et al., 2022). Thematic maps visualize the relevance and research intensity of topics within a specific field. In this way, it becomes easier to identify which topics have been more extensively or less frequently studied within the field (Baytur & Ulaş, 2022).
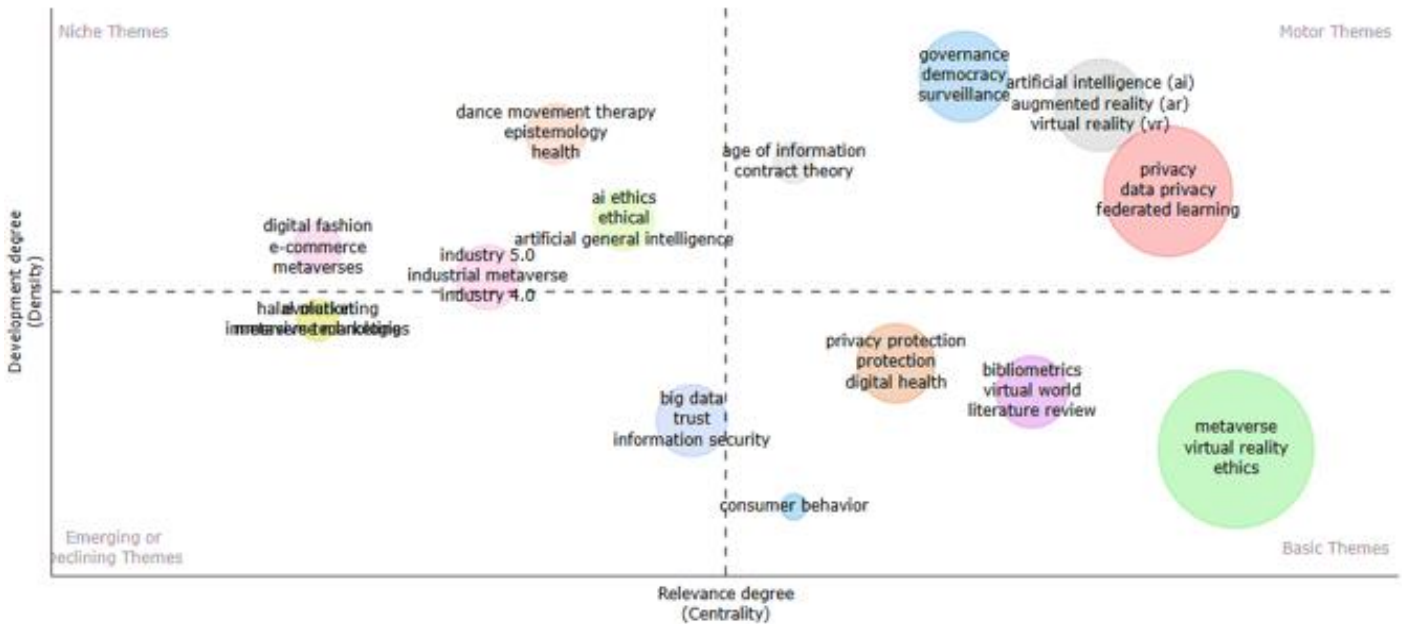
Figure 13: Thematic Map

➤ **Motor Themes:** Themes located in the upper-right quadrant are referred to as "motor themes" due to their high degree of development and their central role in shaping the overall structure of the research field (Yay et al., 2022; Knani et al., 2022; Danaefard et al., 2025). These themes represent the most widely discussed topics within the field (Dilaver et al., 2025). In this study, the motor themes identified in Figure 13 include "artificial intelligence (AI)", "augmented reality (AR)", "virtual reality (VR)", "privacy", "data privacy", "federated learning", "surveillance", and "governance", all of which stand out with their high centrality and level of development.

➤ **Niche Themes:** Positioned in the upper-left quadrant, niche themes are characterized by a high level of development but low centrality, indicating that they hold only marginal importance within the overall research field (Yay et al., 2022; Knan, et al., 2022; Dilaver et al., 2025). These themes are typically associated with specific subfields and are considered narrow in scope and peripheral in nature. In other words, although they exhibit high density (indicating a rich internal structure and closely related topics), their low centrality means they have limited relevance to the broader research domain. Compared to other themes in the reference corpus, they are specialized and marginal, yet they contribute to the development of motor themes. Furthermore, the frequency of their occurrence is limited, and they are not central to the evolution of the research field. Consequently, these themes are often regarded as topics that have been sufficiently explored in recent years (Danaeefard et al.,

2025). In this study, the niche themes identified in Figure 13 include "digital fashion," "e-commerce," "metaverses," "AI ethics," "health," "industry 4.0," "industry 5.0," "artificial general intelligence," "dance movement therapy," and "epistemology." Despite their high level of development, their low centrality suggests that these themes are deeply explored in more specific and niche areas of research but have yet to attain a central position in the overall research network.

➤ **Basic Themes:** Positioned in the lower-right quadrant of the thematic map, basic themes are characterized by their relatively high centrality within the research field but low level of development, indicating that these topics are still in the early stages of conceptual and empirical maturity (Yay et al., 2022; Knani et al., 2022). Despite their limited degree of thematic advancement, they play a critical role in interdisciplinary research and are regarded as significant within the academic literature (Danaeefard et al., 2025). In other words, these themes, though not yet fully developed, possess high relevance and are considered foundational to the structure of the study domain (Dilaver et al., 2025). In this paper, the basic themes identified in Figure 13 include "Metaverse," "virtual reality," "ethics," "privacy protection," "consumer behavior," "digital health," "bibliometrics," and "literature review." These topics occupy a central position in the field, representing core and established concepts that underpin ongoing and future scholarly inquiry.

➤ **Emerging or Declining Themes:** Themes located in the lower-left quadrant of the thematic map are characterized by both low centrality and low density.

These themes demonstrate limited development within the research field and exhibit weak connections with other thematic clusters. This positioning may indicate either the emergence of nascent topics with future potential or the decline of formerly significant themes that are gradually losing relevance and becoming marginalized (Yay et al., 2022; Knani et al., 2022; Dilaver et al., 2025). Emerging themes are not yet fully established but may gain importance over time as they evolve and attract scholarly interest. Such themes often originate as niche or basic topics and progressively develop into more central components of the research landscape. Conversely, declining themes are those with limited recent occurrence and diminishing scholarly attention. Although they may have once functioned as motor or niche themes, their current role in advancing the research field is minimal, and they receive fewer citations and investigations over time (Danaeefard et al., 2025). In this study, the emerging themes identified in Figure 13 include "immersive technologies," "marketing," "information security," and "trust," all of which show signs of increasing relevance and developmental potential.

5. DISCUSSION AND IMPLICATIONS

The ethical discussion surrounding the metaverse stems from the various risks this new digital environment poses, ranging from user privacy to the manipulation of consumer behavior. Recent studies have shown a growing number of published works addressing the intersection of the metaverse and ethics, indicating increasing academic interest in this area. This research aims to analyze metaverse- and ethics-focused studies using bibliometric methods, with the expectation of revealing developmental trends in the literature and guiding future research efforts.

With the advancements in information & communication technologies and the ease of access to information, the number of systematic reviews and bibliometric studies has increased (Yılmaz, 2021: 1481; Umut Zan, 2012: 3). The expansion of bibliometric analyses from information sciences to other fields such as business has further increased academic interest in this method (Donthu et al., 2021: 285-286). Bibliometric analyses reveal the structure and development trends of the literature by examining the relationships between authors, countries, institutions, and topics within a research field (Donthu et al., 2021: 285-287). This method serves as a guide for researchers, as it allows them to identify the prominent topics in the literature, observe trends over time, and explore collaborations among researchers (Zeren & Kaya, 2020: 37-38; Garfield et al., 1978: 180; Umut Zan, 2012: 159).This study presents a bibliometric analysis aiming to comprehensively examine academic publications at the intersection of metaverse and ethics, identifying development trends, research focuses, and key contributing authors, institutions, and countries within the literature. By statistically analyzing the research dynamics emerging from the convergence of these two fields, the study maps the current state of the literature and provides guiding findings for future research. Furthermore, it aims to support the growth of knowledge in this area by determining how academic productivity is shaped in the context of metaverse and ethics and which themes stand out.

When the literature is examined, it is observed that the concept of the metaverse has been the focus of bibliometric analyses in various fields. General bibliometric studies focused on the metaverse (Güler & Zeler, 2024; Gülşen, 2024; Ağgül et al., 2024; Çelik et al., 2022; Abbate et al., 2022) are present in the literature; in addition, various bibliometric analyses have been conducted in fields such as metaverse and education (Koçak & Özbek, 2024; Bizel, 2023; Nedeva et al., 2024; Panda et al., 2024; Taş & Bolat, 2022), management (Durmuş, 2024; Piñeiro-Chousa et al., 2025), health (Damar & Koksalmış, 2024), agriculture (Marcuta et al., 2023), economy (Tunçsiper et al., 2025), and marketing (Sharma et al., 2025; Prados-Castillo et al., 2024; Kumar et al., 2025). However, no bibliometric study has been found at the intersection of *metaverse and ethics*. This indicates a significant research gap in this field and constitutes an important justification for this study to make an original contribution to the literature. Today, bibliometric analyses are widely used in many fields to reveal the development of the literature and research trends. However, a comprehensive literature review shows that there is no study using this method at the intersection of metaverse and ethics. This situation reveals a lack of systematic analysis in the literature despite the increasing importance of ethical issues in a rapidly evolving digital environment such as the metaverse. Therefore, this study aims to fill this gap in the literature and has the distinction of being the first bibliometric analysis that addresses metaverse and ethics together.

It can be stated that studies on metaverse and ethics provide significant insights for both businesses and consumers. From the consumers' perspective, it is essential to exhibit careful and conscious usage behavior in protecting personal data and security in metaverse environments. Although the metaverse infrastructure is built on blockchain technology, this does not mean that data security and privacy risks are completely eliminated. Therefore, consumers need to be aware of the ethical risks they may encounter in digital environments. From the businesses' perspective, companies that will operate on

metaverse platforms should approach users' privacy and security concerns sensitively. Businesses should establish transparent data policies that do not victimize metaverse users and act in accordance with ethical principles. Indeed, while the fact that the metaverse infrastructure is based on blockchain and smart contracts provides a significant advantage in solving ethical issues, it is emphasized that these structures need to be designed in a dynamic and flexible manner (Noyan & Özpençe, 2023). In their study, Behera et al. introduced the concept of a "responsible metaverse" and emphasized that businesses should design their metaverse systems in line with ethical metaverse principles. These principles are based on core ethical values such as producing fair outcomes, protecting individual privacy, and ensuring legal compliance. Within this framework, it is stated that the ethical design and management of metaverse environments are critically important for providing a trust, privacy, and sustainable digital experience for both businesses and consumers (Behera et al., 2024).

6. LIMITATION AND FUTURE RESEARCH

This study focuses on research related to the "metaverse and ethics" indexed in the Web of Science (WoS) database exclusively. Although WoS is considered a reputable source due to its inclusion of peer-reviewed journals with high academic standards, relevant studies indexed in other databases such as Scopus, Google Scholar, and Dimensions were not included. This exclusion constitutes a limitation of the study.

This study, which is expected to guide future research, offers several recommendations in light of the current findings. In future research, bibliometric studies can be conducted by expanding the scope of international databases to include broader and more diverse sources such as Scopus, IEEE Xplore, and Google Scholar, enabling a more comprehensive analysis of studies that address the concepts of metaverse and ethics together. Additionally, in studies focusing on the Turkish context, bibliometric analyses of metaverse- and ethics-related publications indexed in national databases such as DergiPark can be conducted to identify local trends, collaborations, and thematic orientations, thereby contributing to the national literature. Thematic concepts identified in this study may also serve as the basis for future theoretical investigations. Within the framework of metaverse ethics, statistical meta-analyses of findings from various studies beyond bibliometric analysis may be conducted to uncover overarching trends and relationships related to ethical issues in the metaverse. In conclusion, this study highlights the emerging and evolving ethical concerns associated with the metaverse. In future studies, it is

recommended to conduct sectoral bibliometric analyses to better understand the reflections of metaverse and ethics topics across various industries. This study examines the literature that jointly addresses the concepts of the metaverse and ethics. For future research, this topic can be further investigated specifically under the framework of metaverse ethics by employing bibliometric analysis methods. In addition, instead of relying solely on the Web of Science database, future studies may combine multiple databases to conduct a more comprehensive and in-depth analysis of metaverse ethics. This approach is expected to provide deeper insights into sector-specific priorities, opportunities, and ethical challenges, thereby offering valuable contributions to both academic literature and practical applications. This study presents an overview of the field by examining the existing literature that jointly addresses the concepts of the metaverse and ethics. The systematic evaluation of studies produced at the intersection of these two concepts provides a guiding framework for future research in the field of metaverse ethics.

7. CONCLUSION

First, this study uses bibliometric and network analyses to determine the most impactful articles and countries in terms of published articles and total citation counts. Second, metaverse researchers will be able to quickly place authors, institutions, and countries working in specific scientific fields. Scholars interested in collaborating on research projects and discussing their findings with leading authors can benefit from this study. The study highlights that the metaverse is not merely a digital environment but a complex ecosystem that integrates various advanced technologies, such as virtual reality, augmented reality, artificial intelligence, and blockchain, while also presenting associated ethical challenges. Comprehensive ethical studies contribute to the development of strategies that both protect user rights and guide businesses in creating responsible, transparent, and sustainable digital ecosystems. Furthermore, this study reveals that China and the United States stand out as leading countries in both citation impact and research productivity. These countries are at the forefront of academic publications on the metaverse and ethics, demonstrating that the topic is being prioritized and addressed in these regions. However, the ethical dimensions of metaverse should not be viewed as a topic unique to these countries. Awareness and sensitivity to metaverse ethics should be increased in other countries as well, thus encouraging more diverse and global academic participation. In this context, supporting international research collaborations and encouraging studies on metaverse and ethics across diverse cultural and legal

contexts is essential for achieving a more comprehensive and inclusive understanding of the topic. Consequently, research on metaverse ethics is critical to protecting human rights, data security, and societal values in the digital age and is expected to continue to shape academic and practical work in this area. Existing research clearly demonstrates that ethics constitutes a significant area of study in virtual environments such as the metaverse and virtual reality. The literature indicates that studies addressing metaverse-related topics consistently take ethical considerations into account and provide various evaluations and recommendations in this regard. This highlights that ethics has become an integral component of metaverse research. The scope of personal data collected in the metaverse and the sensitivities related to privacy increase the need for regulations and policies grounded in ethical principles. Moreover, the development of the metaverse ecosystem within still immature policy and regulatory frameworks has led researchers to question ethical issues more intensively, thereby contributing to the growing number of studies on metaverse and ethics.

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AUTHORS` CONTRIBUTIONS

The contribution of the first author to the study is 70%, and the contribution of the second author is 30%.

CONFLICT OF INTEREST

There is no conflict of interest in the study.

DATA AVAILABILITY

The study is based on secondary data obtained from the Web of Science (WOS) database.

ETHICAL STATEMENT

This study did not involve human or animal subjects and did not require additional ethics committee approval.

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