

Mapping The Ethical Discourse in Generative Artificial Intelligence: A Topic Modeling Analysis of Scholarly Communication

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Mapping The Ethical Discourse in Generative Artificial Intelligence: A Topic Modeling Analysis of Scholarly Communication

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Abstract

As generative artificial intelligence (GenAI) continues to reshape numerous sectors, the ethical implications of its deployment have become a critical area of society. This study employs a topic modeling technique to systematically analyze a large corpus of peer-reviewed literature related to ethics in GenAI, aiming to uncover prevailing themes and conceptual patterns. Using a natural language processing method, the analysis identified ten distinct topics that were subsequently synthesized into six overarching macrotopics related to ethics in GenAI: (1) education and learning, (2) bias, frameworks, and legal compliance, (3) cybersecurity, governance, and risks, (4) social impact and sustainability, (5) digital transformation and emerging tech, and (6) academic research and writing. Each macrotopic is examined through the lens of existing scholarly literature, providing an overview of current debates in the area. The findings demonstrate the pressing need for comprehensive governance frameworks that prioritize transparency, fairness, and accountability in the development and deployment of GenAI systems. The relevance of the emerging macrotopics extends beyond technical or policy considerations, situating them within broader ethical discourse around language, communication, and media technologies, where questions of authorship, representation, and discursive power are increasingly mediated by GenAI. By mapping the evolving ethical landscape of GenAI, this study contributes to a more informed and critical understanding of how to align technological innovation with societal values and legal norms.

Keywords: Generative Artificial Intelligence; Ethics; Topic Modeling; Themes; Technology

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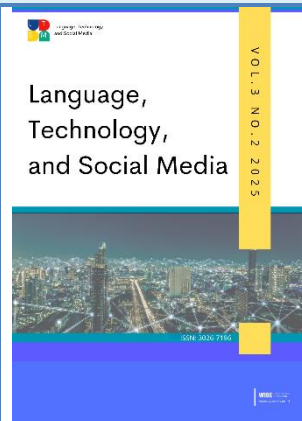
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INTRODUCTION

Generative Artificial Intelligence (GenAI) is reshaping the technological landscape and communicative practices by enabling machines to produce original content such as text, images, audio, video, and code [1]. Unlike traditional AI systems that are primarily designed for classification, detection, or prediction tasks [2], GenAI models learn the underlying patterns of data to generate novel outputs that closely resemble human-created content [3], [4]. This shift has been fueled by advances in deep learning architectures.

GenAI is now being applied across a wide range of fields, including but not limited to education [5], healthcare [6], marketing [7], arts [8], and others. The rapid evolution and integration of GenAI technologies present both unprecedented opportunities and complex challenges. For instance, Teo et al. [9] outlined a range of advantages associated with the application of GenAI in the healthcare domain. Among the key benefits identified are improvements in operational efficiency, both in terms of time and cost savings, and the automation of repetitive or labor-intensive tasks. GenAI also facilitates the synthesis of complex information, supports data augmentation, enables personalization, and enhances predictive analytics and simulation capabilities. Moreover, the technology fosters creativity and content generation, which can be valuable in both clinical and educational contexts.

Yet, the same transformative capabilities that make GenAI so valuable also heighten the urgency for ethical scrutiny. Alongside these benefits emerge a series of risks, chief among them concerns related to data privacy and security, especially in domains dealing with sensitive information like healthcare. More broadly, GenAI's integration into digital communication ecosystems introduces significant ethical dilemmas that extend beyond technical or operational considerations. It is fundamentally reshaping how language is produced, interpreted, and circulated, with far-reaching implications for authorship, credibility, and discourse norms. For example, users of AI-assisted writing often do not perceive themselves as the authors of AI-generated text, yet they publicly claim authorship. This phenomenon, where AI does the writing but humans take credit, manifests fundamental shifts in ownership and authorial identity in digital writing practices [10].

Given these deep social and communicative transformations, the need for a robust ethical framework becomes not merely advisable, but essential. GenAI technologies wield significant influence over society, culture, and individual lives. Their capacity to generate highly realistic content raises pressing concerns about misinformation, deepfakes, data privacy, and intellectual property infringement [11]. From a media and discourse ethics perspective, the indistinguishability of GenAI-generated text from human writing introduces new challenges for journalistic integrity, academic authorship, and trust in communicative authenticity. Moreover, if left unchecked, GenAI can reinforce societal biases, marginalize vulnerable groups, or be misused for harmful purposes such as fraud or manipulation [12], [13]. Ethical oversight is essential to ensure that these tools are developed and deployed in ways that are fair, transparent, and accountable [14]. Without a strong ethical foundation, the rapid advancement of GenAI risks undermining public trust, widening social inequalities, and causing unintended harm.

In response to this need, this study aims to model the main themes present in the existing literature on the ethics in GenAI, addressing several key gaps in the field. Unlike the majority of prior research that typically centers on normative arguments or domain-specific analyses, this study applies topic modeling to systematically map ethical discussions across a large corpus of academic

literature on GenAI. Through this approach, the study provides a more comprehensive understanding of the evolving ethical landscape, revealing underexplored issues and informing future research and policy agendas. By uncovering how the ethical considerations of GenAI are conceptualized and addressed across the literature, this work supports more coherent discourse, evidence-based decision-making, and the development of responsible, transparent, and equitable GenAI systems. Implications also extend to ethical discourse in language, communication, and media technology.

METHODS

Instrument

To investigate thematic structures within the academic literature on ethics in GenAI, we utilized the CrossRef API to retrieve a comprehensive corpus of relevant scholarly articles. The `rcrossref` R package facilitated automated querying with the search term “ethics in generative AI”, retrieving metadata from 1000 articles, which maximizes the records retrievable in a single CrossRef API call. This allowed us to retrieve the largest possible dataset available in one batch, balancing comprehensiveness with computational efficiency. The filtering criteria comprised studies written in English and appearing in academic journals. From each retrieved record, we extracted either the abstract or, if unavailable, the title to serve as the primary textual data source for subsequent analysis.

Procedure

The extracted texts underwent a series of preprocessing steps to prepare for natural language analysis. Initially, all text was converted to lowercase to ensure case-insensitive processing. We then applied regular expressions to remove any embedded HTML tags, punctuation, and non-alphabetic characters. Excess whitespace was normalized to single spaces.

Subsequently, we tokenized the cleaned text into individual words using the `tidytext` package’s `unnest_tokens` function. To reduce noise and enhance model interpretability, stop words – commonly occurring function words lacking semantic content – were removed. Our stop word list combined the standard built-in stop words with a curated custom list tailored for this domain, which excluded frequent but uninformative terms such as “paper”, “study,” “results,” and domain-specific terms like “generative,” “AI,” and “ethics” to avoid biasing the topic model toward these obvious thematic anchors. Tokens shorter than four characters were also discarded to eliminate overly short or fragmented words.

Using the preprocessed tokens, we constructed a document-term matrix where each row corresponds to a document (article) and each column corresponds to a unique term. The entries represent term frequencies within each document. This matrix, created via the `cast_dtm` function from the `tidytext` package, forms the quantitative basis for topic modeling.

We applied Latent Dirichlet Allocation (LDA), a generative probabilistic model in natural language processing for uncovering latent thematic structures in a corpus, using the `topicmodels` R package. The model was configured to identify 10 topics, which balances granularity and interpretability based on prior literature and domain knowledge [15]. The LDA algorithm iteratively estimates two sets of parameters: the distribution of topics within each document, and the distribution of terms within each topic. This dual representation enables characterization of each topic by its most probable terms.

After model fitting, we extracted the estimated per-topic-per-term probabilities (beta or β parameters) using the tidy function. For each of the 10 topics, the top 10 terms with the highest β values were identified and ranked. These terms represent the semantic core of each topic and serve as a basis for qualitative interpretation of the thematic dimensions present in the corpus. Each topic was assigned a descriptive label that best reflected the underlying theme conveyed by the aggregated key terms. This human-in-the-loop process enabled nuanced interpretation of the topics beyond what automated methods alone could achieve, ensuring that the macrotopics accurately captured meaningful research areas within the corpus. In interpreting these topics, attention was given to how clusters of co-occurring terms reflected patterns in ethical language use and how such patterns suggest emergent communicative norms in the scholarly treatment of GenAI ethics. Figure 1 illustrates the procedure of topic modeling.

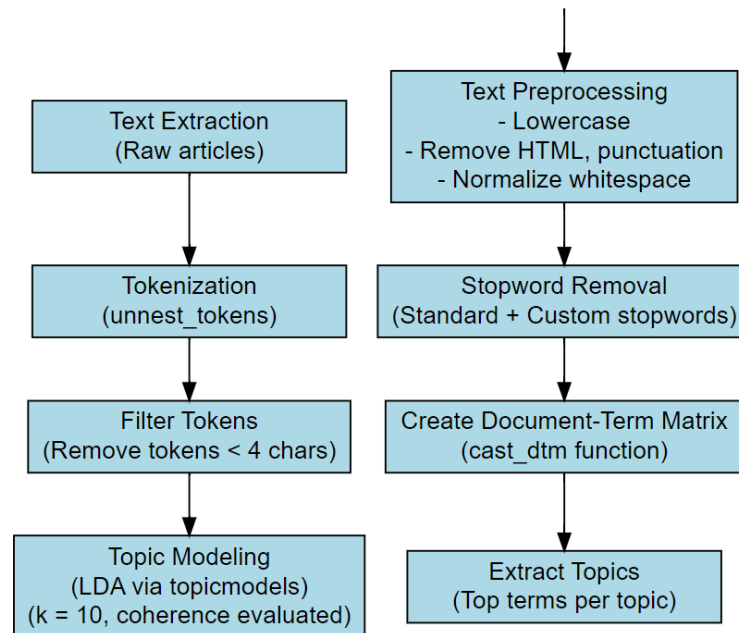


Figure 1. Flowchart showing the procedure of topic modeling.

RESULTS AND DISCUSSION

The key terms across the 10 topics, together with their β values, as emerged from LDA, are illustrated in Figure 2. Each of the topics is discussed below.

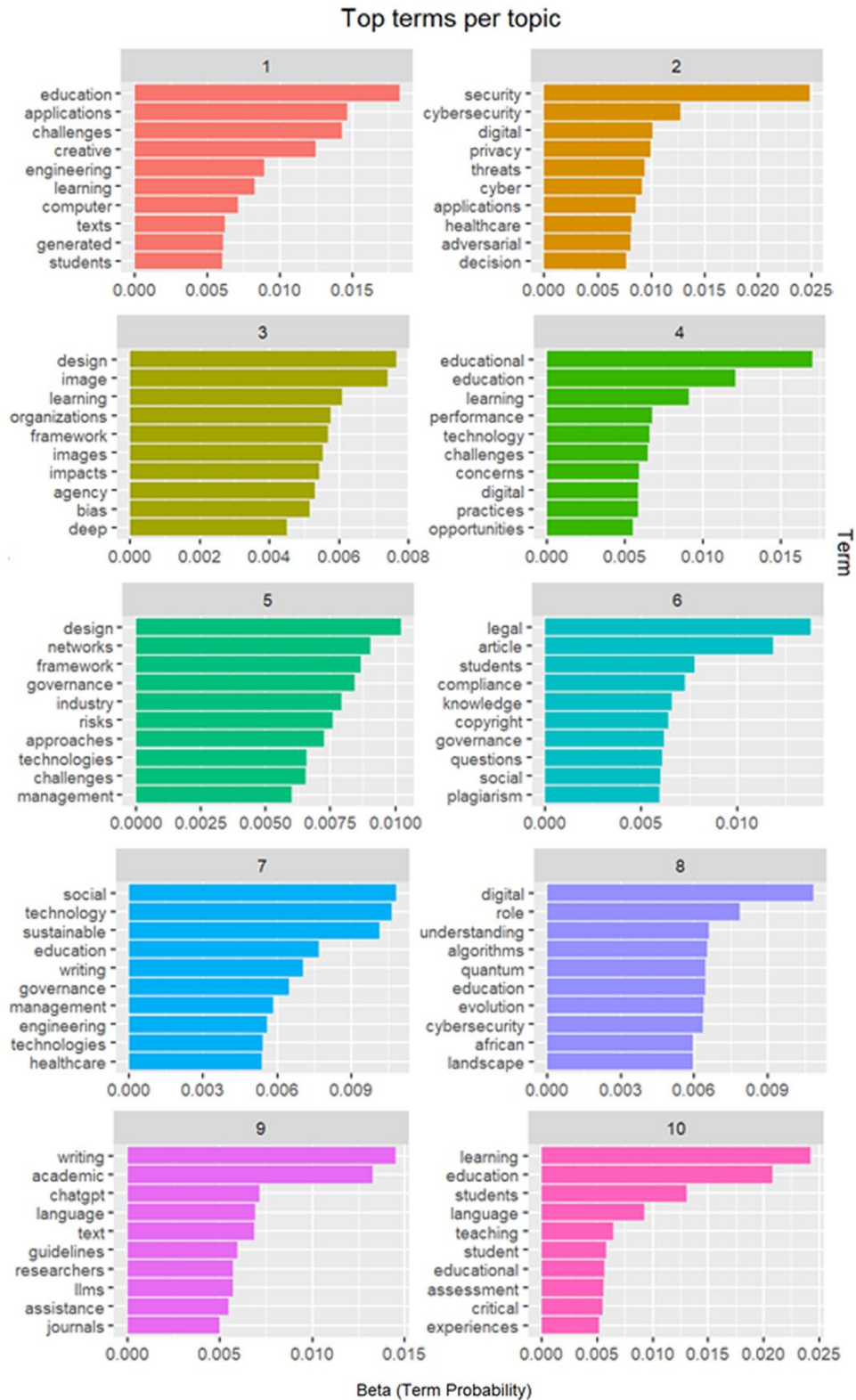


Figure 2. Key terms across the 10 topics and their β values.

Topic 1: Challenges of GenAI in Education

This topic explores the use of AI-generated texts and applications in education, particularly for students engaged in learning, engineering, and creative tasks. The involvement of computers in generating content introduces new challenges within academic settings. These challenges raise

ethical questions about how such technologies influence student learning, the role of creativity, and the integrity of educational processes.

Topic 2: Cybersecurity in GenAI

This area addresses the ethical dimensions of using GenAI in contexts like cybersecurity, healthcare, and digital applications. The presence of terms like privacy, threats, and adversarial points to concerns about AI systems being vulnerable to manipulation or misuse. These risks impact decision processes and raise ethical questions about safeguarding sensitive data, ensuring system robustness, and protecting individuals in high-stakes domains from digital harm or exploitation.

Topic 3: GenAI frameworks and bias

This topic dives into ethical dilemmas in AI deployment, such as bias embedded in algorithms and its impacts on fairness and agency. It investigates frameworks to detect, mitigate, and prevent bias in AI models, considers the societal consequences of biased decision-making, and promotes the development of ethical AI systems that respect human rights and diversity.

Topic 4: Educational GenAI technologies and learning

Here, the emphasis is on emerging AI technologies that enhance learning outcomes and educational performance. It explores digital tools, educational software, and innovative pedagogical practices to create engaging, effective learning environments. Challenges, concerns, and opportunities in digital education are also key themes.

Topic 5: GenAI governance and risk management

Topic 5 covers AI governance and risk management across industries. It involves creating governance frameworks to oversee AI use responsibly. The focus is on managing risks, ensuring accountability, and addressing technological challenges. Effective governance helps balance innovation with safety and ethical concerns. This helps promote safe and ethical AI deployment.

Topic 6: Legal issues and compliance in GenAI

Topic 6 focuses on the legal and ethical challenges related to AI, particularly in education. It covers ensuring compliance with laws and regulations, addressing copyright and intellectual property issues in AI-generated content, and managing plagiarism to protect academic integrity. The topic also involves developing governance policies for ethical AI use, safeguarding student data privacy and rights, and raising awareness about the legal implications of AI among users and institutions.

Topic 7: Social and sustainable GenAI

This topic focuses on the intersection of technology, education, healthcare, and engineering within broader social and sustainable contexts. It reflects ethical considerations around how GenAI and related technologies are managed, governed, and applied responsibly across sectors. The inclusion of terms like writing and education suggests a communicative and institutional dimension, where the ethical governance of AI must align with societal values and long-term sustainability goals.

Topic 8: Digital transformation and emerging tech

This topic captures the shifting role of algorithms, quantum technologies in fields such as cybersecurity and education within the broader digital transformation. It raises ethical considerations around equitable access, local relevance, and the understanding of complex technologies in shaping societal landscapes.

Topic 9: Academic writing and language models

The topic explores AI's impact on academic research and writing and the broader shifts in these areas. It investigates how large language models (LLMs) like ChatGPT assist researchers with drafting, editing, and language processing. Ethical guidelines for AI-assisted writing and the role of AI in enhancing clarity and accessibility in scholarly communication are key themes.

Topic 10: Learning, teaching, and assessment

The main focus is on how GenAI is transforming education, teaching, and assessment, particularly in language learning and student experiences. The terms suggest a strong emphasis on critical engagement with AI-driven tools in educational contexts. Ethical concerns arise around fairness in evaluation, the authenticity of student work, and the impact of AI on the development of meaningful learning experiences and critical thinking skills.

A closer interpretive analysis revealed conceptual overlaps among several topics. To enhance the clarity, interpretability, and analytic utility of the findings, we aggregated them into six broader macrotopics. This reduction process was guided by both thematic similarity and the practical need for synthesis in discussing broader policy and ethical implications. For instance, **Macrotopic 1** combines topics 1, 4, and 10, all of which explore the pedagogical integration of GenAI. This hierarchical synthesis enables a more manageable and meaningful interpretation of the thematic landscape while preserving the richness and diversity of the original findings. The resulting six macrotopics reflect not only the underlying statistical coherence of the data but also the broader discursive patterns observed in the literature on GenAI. Macrotopic categories and their justification are presented in **Table 1**. **Figure 3** displays the macrotopics.

Table 1. Macrotopic categories and justification

Macrotopic number	Macrotopic title	Includes original topics	Justification
1	Education and learning	1, 4, 10	These topics share a strong educational focus. Topic 1 highlights GenAI in creative and academic contexts together with challenges; topic 4 emphasizes AI technologies enhancing learning performance as well as concerns; topic 10 delves into AI-driven teaching, assessment, and critical engagement. Together, they reflect a comprehensive view of how GenAI transforms educational practice, pedagogy, and student experience.

2	Bias, frameworks, and legal compliance	3, 6	Topic 3 examines bias and ethics frameworks in GenAI, while topic 6 emphasizes legal challenges like compliance, rights, and data protection. These dimensions complement each other in their focus on responsible, lawful, and ethical AI usage, particularly in sensitive domains like education.
3	Cybersecurity, governance, and risks	2, 5	Topic 2 focuses on cybersecurity in GenAI, particularly in high-stakes domains like healthcare. Topic 5 discusses frameworks for AI governance and risk mitigation. Merging these emphasizes the systemic need to oversee and secure AI technologies through robust governance, policy, and technical safeguards.
4	Social impact and sustainability	7	This topic addresses GenAI's broader social, ethical, and sustainable implications. It reflects how GenAI intersects with institutional values, responsible innovation, and cross-sectoral governance, especially relevant in education, healthcare, and engineering.
5	Digital transformation and emerging tech	8	This macrotopic captures how advanced technologies like quantum computing and AI algorithms drive digital transformation in various fields. It explores accessibility, ethical concerns, and the structural implications of rapid digital change.
6	Academic research and writing	9	This topic stands apart in focusing specifically on the use of GenAI in scholarly writing and communication. It covers tools, the ethics of AI-assisted writing, and its potential to improve clarity, equity, and efficiency in academic workflows.



Figure 3. Ethics in GenAI macrotopics emerged from topic modeling.

Discussion

This study aimed to identify and analyze the main themes present in the existing literature on ethics in GenAI through a topic modeling approach. By applying LDA to a corpus of academic texts, the analysis uncovered topics that represent key areas of ethical concern and discussion within the field. While there was a degree of overlap among the topics reflecting the interconnected nature of ethical issues in GenAI, each macrotopic emerged with several unique focal points and discourse patterns.

Macrotopic 1 relates to the utilization of AI in the educational context, manifesting matters such as challenges, opportunities in learning and teaching, and compliance with ethical frameworks. Williams [16] discusses the privacy concerns associated with chatbots handling sensitive student data, emphasizing the challenges in consistently complying with data protection regulations. The author also explores the tension between encouraging student independence and the potential decline in academic self-efficacy due to excessive reliance on AI in education. This tension reflects a broader theoretical debate regarding AI's role as an agent within educational processes: to what extent can AI be considered an autonomous contributor versus a mere tool under human control? Plagiarism is identified as a major ethical issue, with AI-generated content posing a threat to academic integrity. Moreover, AI presents significant potential to transform educational assessment. It enables innovative and authentic assessment formats, such as simulations and interactive tasks, moving beyond traditional multiple-choice tests. AI tools support automated grading and instant feedback, improving efficiency and reducing teacher workload. Adaptive assessments can personalize learning experiences by adjusting tasks to individual student performance in real time. These advancements enhance engagement, accessibility, and the ability to assess complex skills like problem-solving, motivation, and teamwork more effectively [17]. However, the integration of GenAI into assessment practices brings important ethical challenges.

Concerns include data privacy, algorithmic bias, and reduced human oversight, all of which require careful scrutiny. Without thoughtful design, AI-driven assessments risk reinforcing existing inequities, especially for learners from diverse backgrounds. In addition, ensuring transparency in how AI algorithms operate is essential for maintaining accountability and trust in the results they produce [18]. This raises a critical ethical question about the locus of responsibility: when AI systems contribute to decision-making in assessments, how can accountability be fairly assigned between human educators and AI agents?

The content of [macrotopic 2](#) is associated with bias, ethical frameworks, and legal compliance. GenAI tools are known to present with algorithmic bias [19], [20], [21]. In a recent study, Georgiou investigated how ChatGPT portrays developed and developing nations through a sentiment analysis approach. The analysis indicated that while ChatGPT generally used positive language for all countries, it showed a clear tendency to describe developed nations more favorably. The findings point to an inherent bias in the model, emphasizing the need for adjustments in LLMs to promote more balanced and equitable representations across countries. Compliance with GenAI is another significant matter. For example, in the field of education, Gonsalves [22] identified plagiarism as a primary issue, emphasizing the need for clear, consistent, and trust-oriented policies to encourage ethical AI use. Recommendations focus on improving communication and fostering a supportive academic culture to strengthen compliance and uphold integrity. Other studies, such as the one by Zahariev [23], investigated whether AI-generated content could qualify for authorship under modern European copyright laws, as most legal systems required originality; the latter was defined as the result of human creativity and free choices reflecting the author's personality, as a condition for copyright protection. It also examined whether AI could be recognized as a co-author or cited as a scientific source. This inquiry demonstrates a theoretical tension around AI agency and human authorship: if AI, which operates based on patterns learned from human data, can be truly creative or autonomous, or is inherently a tool that requires human oversight and attribution. Cheong et al. [24] evaluated how effectively U.S. law addresses the challenges GenAI poses to essential human values such as well-being, privacy, autonomy, diversity, and equity. By analyzing a range of hypothetical scenarios created with expert input, the researchers uncovered critical gaps and uncertainties in current legal protections. To respond to these emerging challenges, the study proposes a "Responsible AI Legal Framework" designed to adapt to evolving threats and incorporate a multifaceted regulatory approach.

Cybersecurity, governance, and risk are covered in [macrotopic 3](#). GenAI tools like ChatGPT can support cyber defenders in protecting systems against malicious intrusions. By drawing on LLMs trained on extensive cyber threat intelligence data, including known vulnerabilities, attack methods, and warning signs, these tools help defenders strengthen their threat intelligence. They enable the extraction of valuable insights and the identification of emerging threats [25]. However, malicious actors can exploit GenAI to launch cyberattacks, either by directly extracting sensitive information or by bypassing ethical safeguards set by platforms like OpenAI. These tools empower attackers to generate realistic social engineering schemes, phishing campaigns, attack payloads, and various types of malicious code, which can then be compiled into executable malware files. Although OpenAI's ethical framework is designed to prevent its language models, such as ChatGPT, from sharing harmful content, attackers have discovered methods to circumvent these safeguards [26]. In the domain of healthcare, although synthetic data helps reduce privacy risks, GenAI models often still rely on some sensitive original data, leaving them vulnerable to threats

like model inversion attacks [9]. These attacks can reconstruct private information used in training, such as MRI scans. In addition, risks of unauthorized data access persist, as seen in OpenAI's March 2023 breach involving leaked personal and payment data [27]. Similar incidents involving medical records could have serious consequences for patient privacy. In terms of governance, Taeihagh [28] introduces GenAI, outlining key risks like data issues, bias, privacy breaches, and lack of transparency. The author discusses governance challenges, including intellectual property, misinformation, societal impacts, and the need for global cooperation. The article calls for adaptive, participatory, and proactive governance frameworks. This underscores a tension between the promise of AI as a tool for societal protection and its simultaneous potential to amplify risks, necessitating governance structures that balance innovation with precaution.

Macrotopic 4 stresses the social impact and sustainability of GenAI within ethical frameworks, which is supported by several studies [29], [30]. Hasas et al. [31] examined the diverse impact of AI on community development, focusing on key areas such as healthcare, education, environmental sustainability, and community empowerment. The study's main aim was to thoroughly examine how individuals in underserved communities perceive and experience the use of AI technologies. The results revealed generally positive attitudes toward AI, emphasizing its potential to drive beneficial social change across multiple sectors. The study highlights the need for deploying AI responsibly in ways that reflect community values, ensuring that technological advancement supports long-term, sustainable development within society. Faria and Troncin [32] explored how GenAI impacts sustainable development in international engineering, healthcare, and education organizations, among others. Through interviews and the Gioia methodology, five themes emerged: improved efficiency, the need for systematic training, ethical and secure service development, high energy demands, and bias in GenAI outputs. The authors concluded that although GenAI supports sustainability by streamlining operations, challenges like energy use, privacy, and fairness remain.

Digital transformation and emerging tech are represented by **macrotopic 5**. The review by Sedkaoui and Benaichouba [33] shows GenAI's strong potential to enhance human creativity and innovation by acting as a collaborative tool. GenAI is reshaping business models, processes, and value propositions across multiple sectors, though its impact varies. Also, there is a growing focus on exploring practical applications of these models. In another study, Al E'mari et al. [34] examined how quantum computing and GenAI are reshaping cybersecurity. They outline how quantum principles threaten current encryption methods and highlight GenAI's dual role in enhancing defense and enabling sophisticated attacks. The combined threat of adversarial AI and quantum computing is emphasized, along with the need for strong safeguards. Lastly, the study reviews quantum-secure solutions like quantum-resistant cryptography and key distribution as critical strategies for protecting future digital systems.

Finally, **macrotopic 6** is associated with ethical aspects of academic research and writing. The use of GenAI in academic writing offers notable benefits. It enhances productivity by automating routine writing tasks such as outlining, idea generation, and grammar suggestions, allowing students and researchers to focus on critical analysis. For nonnative English speakers, GenAI provides valuable language support, improving clarity and inclusivity in academic communication [35]. Also, its ability to deliver instant, personalized feedback helps learners identify and correct mistakes in real time, contributing to improved writing skills and learning outcomes over time [36]. GenAI's integration is also reshaping academic writing discourse by

influencing the ways knowledge is constructed and communicated. This includes shifts in norms around authorship transparency, the reception of AI-assisted texts, and evolving expectations for originality and creativity in scholarship. While AI-generated content can mimic human wit and form, its humor and originality diminish once revealed as machine-made. As AI use grows, especially in writing, ethical concerns arise around transparency, intellectual property, and responsibility. The key ethical issue is ensuring that AI-assisted content is properly disclosed, maintaining integrity in authorship, and accountability in publishing [37].

The relevance of these macrotopics extends well beyond technical or institutional concerns, firmly situating them within the evolving ethical discourse around language, communication, and media technologies. GenAI's influence on how information is produced, disseminated, and interpreted fundamentally reshapes communicative norms and power dynamics. In educational and academic contexts, the integration of AI into writing and assessment practices raises ethical questions. Meanwhile, algorithmic bias in GenAI models intersects with issues of representation and voice in digital media, perpetuating stereotypes or excluding marginalized perspectives unless carefully mitigated. As AI becomes a co-participant in human discourse, whether through chatbots, writing assistants, or content generators, the ethical stakes grow around whose language is amplified, whose data is used, and whose values are encoded in these systems. Therefore, understanding these macrotopics not only informs technical and policy interventions but also contributes to critical discussions on the social responsibilities of communication technologies in shaping inclusive, fair, and democratic media ecosystems [38].

CONCLUSION

Taken together, the findings provide a comprehensive overview of the ethical landscape surrounding GenAI and indicate the multifaceted nature of ongoing scholarly conversations in this rapidly evolving domain. The six macrotopics uncovered through LDA reflect a diverse range of debates across key domains such as education, cybersecurity, healthcare, intellectual property, compliance, and social impact, among others. Collectively, these topics illustrate both the immense potential and the significant risks associated with GenAI technologies. Ultimately, this study contributes to the growing body of research advocating for responsible GenAI development and deployment, emphasizing the necessity of transparency, fairness, and human oversight to ensure these technologies serve the broader public good. Future studies could deepen the exploration of ethics in GenAI by integrating multilingual datasets and applying advanced processing techniques to uncover subtle ethical issues. They might also investigate the evolving ethical challenges as GenAI technologies advance and diversify, and examine the real-world impacts of governance frameworks across different cultural and regulatory contexts. Finally, as GenAI continues to evolve, future research should consider how these technologies may reshape linguistic ethics, influence media communication norms, and transform speech-text interaction, prompting a reexamination of communicative standards in both digital and institutional settings.

LIMITATIONS

The study faced several limitations that may have influenced the comprehensiveness and objectivity of the findings. First, the dataset was restricted to articles retrievable via the CrossRef API, potentially excluding relevant works framed under different terms or contexts, resulting in

incomplete thematic coverage. Another key limitation of this study lies in its reliance on abstracts and titles as the primary textual corpus for topic modeling. These elements often omit detailed discussions, detailed arguments, and contextual framing with regard to complex and sensitive issues such as ethics. This reliance may have constrained the semantic depth and richness of the analysis, potentially overlooking implicit or more elaborately developed ethical considerations that are only fully articulated in the main body of texts. As a result, certain themes may appear underrepresented or overly generalized. The search approach also introduced a language and disciplinary bias, favoring English-language, Western-centric sources indexed in CrossRef, thereby underrepresenting diverse ethical perspectives from nonWestern or interdisciplinary communities. In addition, the process of grouping topics into macrotopics required human interpretation, which, while informed, introduced an element of subjectivity and potential researcher bias in theme categorization. Finally, while detailed discourse analysis or semantic network mapping could provide deeper linguistic insights into how ethical issues are framed and connected, the focus here was on analyzing a large corpus for overarching trends.

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AUTHOR CONTRIBUTION

G.G. was responsible for Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Supervision, and Project Administration.

CONFLICT OF INTEREST

The author declares no conflict of interest.

DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

The author used AI during the preparation of this work to refine the language and structure of the paper. After utilizing the tool/service, the author thoroughly reviewed and edited the content as necessary and assumed full responsibility for the publication's content.

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