

Zhang, Hualin; Bi, Kun; Tian, Li

Conference Paper

How Artificial Intelligence Generated Content can be Effectively Regulated: A Technological Governance Framework Based on Algorithm, Data, and Computing Power

24th Biennial Conference of the International Telecommunications Society (ITS): "New bottles for new wine: digital transformation demands new policies and strategies", Seoul, Korea, 23-26 June, 2024

Provided in Cooperation with:

International Telecommunications Society (ITS)

Suggested Citation: Zhang, Hualin; Bi, Kun; Tian, Li (2024) : How Artificial Intelligence Generated Content can be Effectively Regulated: A Technological Governance Framework Based on Algorithm, Data, and Computing Power, 24th Biennial Conference of the International Telecommunications Society (ITS): "New bottles for new wine: digital transformation demands new policies and strategies", Seoul, Korea, 23-26 June, 2024, International Telecommunications Society (ITS), Calgary

This Version is available at:

<https://hdl.handle.net/10419/302520>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

How Artificial Intelligence Generated Content can be Effectively Regulated: A Technological Governance Framework Based on Algorithm, Data, and Computing Power

Hualin Zhang ¹, Kun Bi ^{2*}, Li Tian ²

¹ Division of Arts, Shenzhen University, Shenzhen, China

² School of New Media, Peking University, Beijing, China

* Email: bikun22@stu.pku.edu.cn

Abstract: Artificial Intelligence Generated Content (AIGC) encompasses content classification, production methods, and technologies for automated content generation. The emergence of ChatGPT has accelerated the growth of AIGC, emphasizing the need for proper governance to prevent crises. The technical advancement of AIGC has revolutionized media content and production mechanisms, challenging traditional governance paradigms. This study delves into the technical aspects of AIGC governance, focusing on algorithms, data, and computational power. AIGC relies on massive data collection, iterative digital modeling, and large-scale computation for autonomous content generation, reflecting its evolution to maturity. A tailored governance framework will guide future AIGC development effectively.

Keywords: Artificial Intelligence Generated Content, Technological Governance, Governance Framework, Digital Transformation

I. Introduction

AIGC Technology (Artificial Intelligence Generated Content) possesses disruptive advantages in content creation, information processing, decision support, and scientific research. It has been extensively applied in creative design, entertainment games, advertising marketing industry, education training, and medical science, significantly improving commercial returns and research efficiency. However, this technology impacts the economy, labor force, and society carries uncertainty. Studies indicate that the generation process of AIGC could potentially lead to and exacerbate security issues and inequity in development opportunities. Confronting the crises brought about by AIGC technology, initiating governance of AIGC technology bears profound practical significance and contributes to the sustainable development of AIGC technology in the future.

At present, scholars' research on the governance of AIGC technology mostly stems from the content it produces, focusing on the issues inherent in the generated content and its governance strategies. Scholars generally believe that the content generated by AIGC technology carries major risks including misinformation, fake news, copyright disputes, and ethical harm. In terms of governance approaches, academia has experienced a shift from traditional technological criticism to moral responsibility embedding, to a mixed path of technological practice and application; in terms of governance strategies, the viewpoints of Chinese scholars can be mainly summarized into three aspects: incorporating AIGC into market trading rules, legislative management, and ethics review. Specifically, the first one is to clarify the copyright ownership of the content generated by AIGC and the commercial transaction rules it should follow, ensuring that AIGC technology is not used for illegal industries and gray industries' profit; the second is to strengthen the legal normative management of AI generated content, with the purpose of controllability and accountability, to establish tort liability identification regulations based on AIGC producers' responsibilities and users' faults, consolidating the legal basis for the credible development of AIGC; the third is to strengthen ethical quality review, ensuring that the generated content is ethically acceptable, conforming to social and individual values and moral standards. Regarding governance subjects, the collaborative governance involving multiple subjects such as governments, companies, and users, jointly establishing safety standards and evaluation mechanisms, has been recognize. Various governing

bodies must make adjustments to their boundaries, means, and structures in order to achieve effective regulation of technology governance. In contrast, current research on the governance system for AIGC risks from a technical perspective is relatively scarce. Scholars often regard the application scenarios of AIGC technology as the research object, considering data desensitization, scenario adaptation, algorithm transparency, data protection, technical scenario adaptation, user management, technical norms, etc. as the key topics that AIGC technology needs to pay attention to, and procedural and systematic technology governance systems are rarely mentioned.

Drawing upon the current practical applications of Artificial Intelligence Generated Content (AIGC) and previous research, this study adopts a critical perspective. The study delineates the unique characteristics of the technological generative process, and conducts a risk assessment at three levels of AIGC technology: algorithm, data, and computational power. It proposes corresponding governance strategies to maximize potential benefits and minimize harm, aiming for the safe, inclusive, and sustainable development of AIGC technology. This provides a systematic approach to AIGC risk management from a technological perspective.

II. The Generative Evolutionary Logic of AIGC Technology

AIGC is defined as "a type of content classified from the producer's perspective, a method of content production, and a set of technologies for automated content generation". Thus, AIGC features both content and technology aspects, reflecting the new logic and forms of information content generation that accompany technological evolution. AIGC technology was born in the 1950s amidst the development and research of artificial intelligence, where scholars mainly used rule-based systems to generate simple text and images. In the mid-1990s, the emergence of statistical models and machine learning algorithms made the generated content more complex and realistic, with features such as automatic recognition and simultaneous interpretation becoming possible. In the 21st century, the "generative" ability of artificial intelligence has been revolutionized with the development of deep learning technology, significantly enhancing the quality and diversity of intelligently generated content. From 2022 to date, a series of outstanding AIGC products such as GPT, BARD, DALL·E have further driven the explosive growth of the AIGC industry. Chinese technology companies have also launched AIGC technology products, such as ERNIE Bot, PanguLM, Alibaba M6, Baidu Intelligent Cloud, and JD K-PLUG, making AIGC technology more

localized and creative in understanding and creating Chinese content.

In the generative evolution process of AIGC technology, algorithms, data, and computing power are the three key levels and elements. There exists a foundational iterative and derivative relationship among them. They reflect the stages of the emergence, evolution, and relative maturity of AIGC technology, and ultimately work together to help AIGC technology achieve its corresponding functions.

Algorithms serve as the foundational units for data processing, pattern learning, prediction making, and decision optimization. The development of generative models, deep learning, natural language processing, and other algorithms continues to enhance algorithm accuracy. For instance, the advancement of generative models enables computers to create new content such as text, images, and audio based on input data. Typical generative models include Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and autoregressive models. For example, DeepMind's Generative Adversarial Network, which includes both a generator and a discriminator, improves the generator's capabilities through adversarial training and has achieved significant results in image generation. On the other hand, natural language processing and computer vision represent two technical task directions of algorithms. The former encompasses language modeling, word vector representation, text generation, etc., mainly utilizing word embedding, attention mechanisms, and sequence-to-sequence models to process different forms of raw data. This enables models such as GPT to generate high-quality textual content. The latter primarily includes image generation, image recognition, object detection, etc., which can be implemented through Convolutional Neural Networks (CNNs), Generative Adversarial Networks (GANs), and transfer learning methods. For example, AlphaGo, with its deep learning technology, demonstrates the potential of AIGC technology in the field of computer vision by possessing Go playing abilities that surpass human level.

High-quality, diverse data is key to the success of AIGC technology. The quantity and quality of data utilized for model training and testing play a pivotal role, as they determine whether the algorithm can effectively learn patterns and make accurate predictions. Relevant technologies include data collection, storage, processing, analysis, and application. Structured, semi-structured, and unstructured data are obtained through sensors, networks, and APIs, and are stored in

appropriate locations for processing and subsequent usage. In data processing process, security, efficient access, and ease of analysis are basic principles. Data supports pattern and relationship mining of data mining, machine learning, deep learning, and other technologies after being cleaned, transformed, and integrated. The ultimate goal of data is to translate insights obtained from data into practical application value, providing concrete handles for developing predictive models and building intelligent systems.

Computing power refers to the capability of computing resources. The development of computing power can significantly enhance the computational speed, storage capacity, and processing ability of AIGC technology. AIGC technology requires a vast amount of computing power to train complex algorithmic models and process massive data. The development of cloud computing platforms, GPUs, TPUs, and other dedicated hardware provides support for guaranteeing powerful computational power, accelerating the development of generalized AIGC technology. For instance, reinforcement learning technology requires results learned from extensive interactions between agents and the environment of a certain scale to determine the optimal decision-making strategy. Core concepts of reinforcement learning include states, actions, reward signals, and value functions.

Hence, the evolution of AIGC technology starts with a large data set, proceeds through digital models based on program algorithms, learns output methods through channels such as natural language and computer vision, and ultimately achieves autonomous generation with the support of scaled volume. Among these, data is the core resource for the development and evolution of AIGC technology. AIGC requires large-scale data sets as training samples. The richness of data resources is crucial for the healthy and sustainable development of AIGC technology. The quality and scale of the data set directly influence the performance and effect of AIGC technology. Algorithms are the foundational units for the continuation and derivation of AIGC technology. Through technological iteration, emerging new generative models provide optimized paths for efficiently achieving task objectives. Computing power provides the underlying guarantee for AIGC's scaled operation. Powerful computing capabilities and scaled resource configuration allow for targeted hardware upgrades, support parallel computation of different resources, parameter optimization, and model inference, accelerating model training and inference processes, and enhancing the efficiency

and performance of AIGC technology.

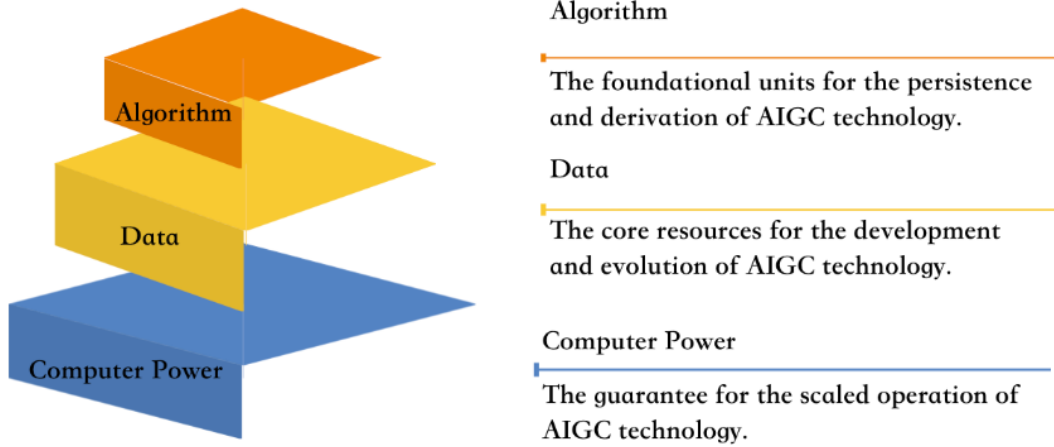


FIG. 1 Generation and evolution logic of AIGC technology

III. AIGC Model Governance: Enhancing the Interpretability and Transparency of Algorithm Models

Algorithmic models are the key drivers of breakthroughs in AIGC. In recent years, the advancement and iteration of algorithms such as generative adversarial networks, multimodal pre-training models, diffusion models, and natural language processing have injected strong impetus into the leapfrog development of AIGC. At the same time, the "black box" problem of AIGC models is becoming increasingly thorny. With the evolution of algorithmic models, the parameter volume and complexity of AIGC algorithmic models have increased significantly compared to before, and the two technical risks, insufficient transparency and algorithmic bias, hidden in algorithmic models have become increasingly severe.

The transparency and interpretability of algorithm models are crucial for the development and application of AIGC, impacting whether the AIGC system can ensure its fairness, credibility, and compliance. Faced with the reality of ever-increasing complexity in algorithm models, it is imperative to adopt corresponding measures to enhance the transparency of algorithm models in order to overcome challenges related to lack of transparency and algorithm bias, both during the stages of algorithm development and application.

At the algorithm application stage, emphasizing the development and utilization of interpretability tools is a necessary measure to enhance the transparency of algorithm models. The AIGC produced by popular large language models has the characteristics of intuitive output results and rich modalities, but its recognizability and interpretability of operational rules and causal logic are quite limited. Therefore, technicians should strengthen the development and utilization of interpretability tools. For example, they can evaluate the impact of specific parameter changes in the model on output variables through Local Interpretable Model-agnostic Explanations (LIME), use SHAP (SHapley Additive exPlanations) to explain the outputs of machine learning algorithm models or develop new interpretability tools. These tools can reveal the dependency relationship of algorithm models on input data features, thereby helping themselves and other entities understand the operating mechanism and decision-making process of AIGC algorithms, providing a reliable basis for AIGC technology governance. Moreover, strengthening the application of data visualization technology can also help other entities understand the operating mechanism of algorithms. By improving the level of data visualization technology and visualizing the core process of input, output, and decision-making of AIGC models, the understanding and cognition of other entities on AIGC models can be effectively enhanced, providing support for social and public supervision.

Algorithm bias is another significant technical risk in AIGC algorithm models, which can generally be divided into two categories of origin: one is the inherent bias-related flaws in the algorithm model itself; the other is the limitations of the developer's personal cognition and value concepts integrated into the model through the development and design process. Although the above measures to improve the transparency of algorithm models also contribute to the identification and governance of algorithm bias risk, from a technical mechanism perspective, it is challenging to solve the algorithm bias problem at the algorithm research and development stage by directly deleting, blocking, or modifying some model parameters. This is because biases such as gender and age are usually associated with complex model parameters, and the algorithm based on statistical mechanisms only reflects the frequency and co-occurrence relationships in the data. The limitations of the statistical mechanism itself mean that governance measures for parameters yield little effect.

Utilizing third-party detection tools is another technical means to detect and eliminate

algorithm discrimination, and many enterprise platforms and research institutions have made active attempts. For example, the whitebox framework DeepXplore, which systematically tests real-world deep learning systems, can trace the defects and vulnerabilities of AIGC systems through specific methods, exposing the flaws and shortcomings in the algorithm neural network. IBM has open-sourced its bias detection tool AI Fairness 360 toolkit, which conducts multidimensional evaluations of fairness metrics and bias mitigation algorithms to alleviate biases that may be caused by the machine learning process at different stages. In addition, LOREN developed by a team from Fudan University also provides a new paradigm for explainable fact-checking.

IV. AIGC Platform Governance: Building Safe, Normative, and Shared Data Standards

Data is a crucial support for training and testing AIGC algorithm models, and the emergence of any excellent AIGC algorithm model is inseparable from the support of high-quality data. Currently, large data corpora and training sets provide basic assistance for the development and creation of AIGC, and their sources are quite diverse, such as open data sources, cooperative shared data sources, original data sources relying on crawling, purchased data sources, and generated annotated data sources.

The diverse sources of data pose certain obstacles to the entire process of data utilization, namely, data collection, annotation, cleaning, and storage, slowing down the speed of technology model development. Therefore, to improve the development efficiency of AIGC algorithm models, the platform, as a field of data resource technology collection, has become an important carrier in the process of AIGC technology development. Admittedly, the platform provides rich and practical data resources and development conditions for a wide range of organizations and individuals. However, the uneven quality of data resources and development tools has buried hidden dangers for the generation of AIGC technology risks.

Data security is the primary technical risk in AIGC platform governance, which can be mainly divided into two categories: one is that AIGC algorithm models use or accumulate unsensitized, illegal, or security-problematic data for training and testing, infringing personal privacy and threatening national information security. For example, Facebook was penalized for using unauthorized and unsensitized user biometric feature images for algorithm training, violating the

collection and use requirements for data training in Illinois' Biometric Information Privacy Act (BIPA). This case is also the largest consumer privacy case in U.S. history. Microsoft, Amazon, and Google are currently facing similar lawsuits. The most successful large model currently, ChatGPT, developed by OpenAI, also has potential risks in data use. The regulations for using data resources on its official website do not explicitly explain the use and openness of data on the platform, but merely acknowledge that they "will collect and use the data entered by users when using the service." However, the types of models that can be accessed by the data source and the details of feature development are not specified. When private data enters AIGC services, malicious users can use specific interaction modes to obtain private data, leading to the leakage of private data. To address these problems, on the one hand, developers and platforms should be encouraged to practice the design principle of balancing development and security, strengthen the development and use of data desensitization technology, and give users appropriate control over personal data, ensuring that the output results of AIGC systems respect and protect personal privacy. The overall privacy framework applicable to the algorithm model should maintain the basic ability to process public data while supporting the use of AIGC system privacy protection technology. On the other hand, scrutiny of data origin, quality, and content features should be strengthened to identify whether data resources are reliable and usable.

The second is that AIGC algorithm models use codes containing malicious or defective elements for development or testing, causing the algorithm model to fail to run safely and smoothly. Currently, the training data of many AIGC algorithm models contain various open-source code libraries. However, the quality of these open-source codes is uneven, and using them without discrimination may lead to serious consequences. If the open-source code contains malicious software code, it will generate network attacks and attack related programs once used. If the quality of the open-source code is poor, the code depended on it may have inherent defects. Once defective code is generated, its propagation path is usually difficult to trace, so the adverse effects are also difficult to estimate, control, and mitigate. In addition, as AIGC platforms have been widely integrated into programmers' daily work environment, if the AIGC platform itself contains problematic code, the specific functional code it generates may have security issues. This can lead to the program being unable to run or, in severe cases, introduce vulnerabilities that cause program

operation chaos. In response to this issue, platforms and developers should jointly take on the responsibility of verification, establish an effective quality screening and evaluation communication mechanism, and eliminate open-source codes or tools containing malicious codes or poor quality, to ensure the sustainable development of the development platform.

Data normativity is another significant risk that AIGC platform governance has to face, mainly including dataset bias and data property issues. The problem of dataset bias originates from the fact that any original data in any dataset has the risk of containing discrimination or bias, and the increasing popularity of unsupervised learning data annotation has to some extent strengthened the possibility of this risk. The issue of data property is because some data's property are disputed, and using such data may face certain legal risks. Facing these two issues, performing pre-review is undoubtedly an effective way to avoid AIGC data risks. In addition, content-oriented post-review is also an exploratory governance path. For example, developing digital watermarking technology and building a cross-platform generic marking algorithm for synthetic content. This method adds watermarks without affecting the quality of the text generated by the large model. Validators can use the algorithm to verify the digital watermark in the text, thereby quickly identifying machine-generated text content and avoiding digital products being tampered with and illegally used during dissemination. Although this technology has the ethical controversy of algorithm "self-supervision," the traceable safety path management system it establishes undoubtedly portrays a good prospect for the standardized development of AIGC products and services.

The establishment of data sharing standards is also one of the important issues in AIGC platform governance. Currently, there are significant differences in the agreements for data circulation, allocation, and service, and the sharing norms urgently need to be improved, especially for vertical industries. The application of AIGC algorithm models in vertical industries cannot be separated from the support of the entire industry's data resources. However, due to the lack of widespread consensus on data circulation, allocation, and service between different platforms, the objective existence of technical barriers hinders the integration and utilization of industry data resources. This affects the strong alliance between basic large model service providers and vertical industry enterprises, significantly slowing down the speed and efficiency of AIGC technology enabling vertical industries. Therefore, it is necessary to establish and improve a reliable

international cooperation mechanism that supports data resource circulation, realize the safe flow of data including cross-border data flow, which is crucial for AI development and deployment, provide necessary data support for AIGC technology development, provide more accurate and diversified data services for enterprises, as well as huge, high-quality data resources, so that enterprises can fully develop AIGC-related products and services with the support of industry big data.

V. AIGC Industry Governance: Ensuring Sustainable Supply of Computing Power and Scalable Resource Allocation

Computing power is a necessary guarantee for the development of AIGC and the basis for the transformation of traditional industries and the construction of the AI industry ecosystem. While there are various forms of computing power, such as heterogeneous computing power, edge computing power, green computing power, and supercomputing power, they can generally be categorized into on-site computing power and processing power. On-site computing power refers to the localized computing capabilities provided by hardware infrastructure, while the focus of processing power lies in the speed and level of scalable allocation of computing resources.

In reality, the development of computing power services in China is facing significant challenges. In terms of hardware equipment, the import of high-end chips in China is currently under US sanctions. Although Chinese enterprises have made breakthroughs in various fields of AIGC, there is still a certain gap with the international advanced level in terms of high-performance computing and AI chips, which has also become one of the "bottleneck" problems in Chinese AIGC field. In addition, the computing power currently serving AI in China is relatively insufficient. As the parameter size of AIGC algorithm models increases, the demand for computing power significantly increases, and the contradiction between supply and demand of computing power may further intensify. In terms of resource allocation, although the construction of data centers in China is in full swing and the "Eastern Data Western Computing" project is steadily advancing, the distribution of computing power resources in our country still presents structural dilemmas of unbalanced layout and uneven distribution. When the channels for the circulation of computing power resources are not smooth, it is difficult for computing power services to effectively allocate available computing power resources as needed, and the level of scalable allocation of computing

power resources still needs to be improved.

In view of the above problems, China should first pay great attention to the research and development and construction of AIGC infrastructure, actively promote the development of the cloud computing industry, carry out extensive cooperation with large cloud platforms, jointly solve technical research and development problems and the problem of insufficient computing power for AI, improve the speed and level of scalable allocation of computing power resources, establish interoperable channels for the circulation of computing power resources and unified standard norms for technical services, to ensure that researchers, technicians and enterprises can obtain the necessary computing power resources for research, development and deployment of AIGC, and lay a solid foundation for the government, local enterprises and relevant organizations to deploy AIGC systems efficiently, securely, and on a large scale; secondly, a governance framework promoting AIGC innovation and a cross-industry, cross-department AIGC regulatory system should be established. While realizing comprehensive and effective industry regulation, maintain the institutional flexibility and resilience of the governance framework, focus on protecting privacy and intellectual property rights, open high-quality data resources involving multiple industries and fields, provide necessary space and practical support for the technology research and development of AIGC, to stimulate the innovative vigor of the AIGC field, and thus vigorously promote the application of national AIGC-related strategies. At the same time, this governance framework and related regulatory agencies should take a series of incentive measures to promote the adoption of AIGC technology by government departments, traditional industries and relevant organizations; finally, the work of cultivating talent teams for AIGC technology should be valued. On the one hand, the government should focus on training AI researchers, enhance academic exchanges and cooperation in the field of AI, and improve the research ability and level in the field of AI; on the other hand, the government should strongly support the transformation of traditional industry practitioners, join relevant institutions and educational organizations to cultivate practitioners' algorithm literacy, provide corresponding support for practitioners affected by AIGC, to adapt to the employment needs of different industries and regions.

VI. Conclusion

Algorithms, data, and computing power are the three core levels of AIGC technology. With the

rapid iteration and evolution of AIGC technology, each level breeds corresponding technical risks: the increase in the number and complexity of AIGC algorithm model parameters exposes the technical risks of insufficient transparency and implicit algorithm bias; the training and testing needs of AIGC algorithms highlight the issues of data security, normativity, and sharing; insufficient infrastructure construction and unbalanced resource allocation are macro issues that must be faced as the demand for AIGC computing power increases. Facing the technical risks at these three levels, this article, based on the actual situation in China and combining the basic characteristics and development frontiers of AIGC technology, proposes targeted governance ideas and suggestions, that is, improving the interpretability of models at the algorithm level, making full use of third-party detection tools; at the data level, attach importance to data security, improve data norms, establish sharing standards; at the computing power level, strengthen basic infrastructure construction, establish effective industry regulation, and promote talent team construction. Only by correctly understanding, grasping, and resolving the technical risks at these three levels can we pave the way for AIGC to truly enter the era of computing power economy.

In addition, it is worth noting that when promoting international exchange and cooperation in AIGC technology governance, attention should also be paid to the potential value tensions and cultural differences in AIGC technology governance. In terms of algorithm transparency and interpretability, some countries may place more emphasis on the interpretability and transparency of algorithmic decisions to ensure fairness and compliance, while others may focus more on the efficiency and accuracy of algorithms; in the scale of data governance, different countries may have different legal and cultural concepts of data protection, such as more stringent restrictions on data collection, processing, and sharing in EU, while other countries may have a more open attitude towards this; in terms of computing power support and development direction, different countries have different standards and focuses for the application of AIGC technology in employment, medical treatment, military and other fields, which may lead to conflicts in values in the application of AIGC digitization. Therefore, in AIGC technology governance, we should respect the conceptual differences and conflicts between countries, and build a win-win and inclusive AIGC cooperation governance framework on the premise of being alert to ideological risks.

References

1. Brown, T. B., Mann, B., Ryder, N., Subbiah, M., Kaplan, J., Dhariwal, P., & Amodei, D. (2020). Language models are few-shot learners. arXiv preprint arXiv:2005.14165.
2. CHEN J J, BAO Q B, SUN C Z, et al. LOREN: logic-regularized reasoning for interpretable fact verification[J]. Proceedings of the AAAI Conference on Artificial Intelligence, 2022, 36(10): 10482-10491.
3. CHENG L, LIU X L. From principles to practices: the intertextual interaction between AI ethical and legal discourses[J]. International Journal of Legal Discourse, 2023, 8 (1):31-52.
4. DWIVEDI Y K, KSHETRI N, HUGHES L, et al. Opinion paper:“So what if ChatGPT wrote it?” multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy[J]. International Journal of Information Management, 2023, 71:102642.
5. Kent Walker. An opportunity agenda for AI. [EB/OL]. (2023-11-14) [2024-1-15]. <https://blog.google/outreach-initiatives/public-policy/google-ai-opportunity-agenda/>.
6. KIRCHENBAUER J, GEIPING J, WEN Y, et al. A watermark for large language models [J]. arXiv preprint, 2023, arXiv:2301.10226.
7. LUND B D, WANG T, MANNURU N R, et al. ChatGPT and a new academic reality: artificial intelligence-written research papers and the ethics of the large language models in scholarly publishing[J]. Journal of the Association for Information Science and Technology, 2023, 74(5):570- 581.
8. Open AI. Privacy Policy. [EB/OL]. (2023-11-14) [2024-2-7]. <https://openai.com/policies/privacy-policy>.
9. PEARCE H, AHMAD B, TAN B, et al. Asleep at the keyboard? assessing the security of GitHub copilot’s code contributions [C]// Proceedings of 2022 IEEE Symposium on Security and Privacy (SP). Piscataway: IEEE Press, 2022: 754-768.
10. Proceedings of the AAAI Conference on Artificial Intelligence, 2022,36(10): 10482-10491.

11. Qiao, Z. (2023). Risks and countermeasures of artificial intelligence generated content technology in content security governance. *Dianxin Kexue*, 39(10), 136.