

Copyright protection and legal regulation of artificial intelligence creations

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Abstract. With the progress of artificial intelligence technology, its application in the creative field continues to extend to literature, music and visual arts. This study analyzes the dual problems faced by copyright protection and the legal governance of creative achievements produced by artificial intelligence. The investigation first needs to clarify the basic attributes and outstanding characteristics of artificial intelligence works. It then assesses the effectiveness of existing copyright frameworks in dealing with such works. With the help of a detailed analysis of the author identity and original standards, this paper finds out the key deficiencies of the current legislation, and gives specific suggestions from the three key points of establishing a reasonable limit of use, clarifying tort liability, and implementing protection mechanisms. The conclusion summarizes the potential path to improve the legal system. Educational initiatives to enhance social awareness of AI-generated content governance are also proposed.

Keywords: artificial intelligence, copyright, regulatory protection.

1. Introduction

Under the wave of technology in the 21st century, artificial intelligence, also known as artificial intelligence, has successfully transformed from a fantasy in science fiction to a key technology in the real world. In the field of creative industry, the application of AI is slowly changing our understanding of creation. Through machine learning algorithms, AI can generate text, images, audio and other forms of content, and these works completed by AI independently or with the assistance of humans are called "artificial intelligence creations." However, this emerging phenomenon has brought unprecedented legal challenges, especially when it comes to copyright protection [1]. Traditional copyright law is mainly designed around the rights of human creators, in the face of the new situation of AI as a creator, the current legal framework appears inadequate.

This section initiates by contextualizing artificial intelligence-generated content within contemporary sociotechnical developments, emphasizing its growing societal relevance. Following an exposition of the research's academic and practical significance, the chapter outlines forthcoming analytical segments detailing copyright law's treatment of machine-generated outputs. Methodologically, it combines comparative case law examinations with legislative analysis across jurisdictions to formulate balanced regulatory proposals. The investigation ultimately seeks to establish legal parameters that reconcile innovation incentives with creator protections. The new "Concentrated Areas of Legal Dispute" column is shown in Table 1.

Table 1. Global Distribution of AI-generated Content Types (2023)

Content type	Market share	Copyright dispute rate	Fields of concentrated legal disputes
Text generation	38%	62%	News plagiarism/contract template
Image generation	45%	78%	Portrait rights/style appropriation
Audio generation	12%	55%	Melody similarity/Sound cloning.
Code generation	5%	33%	Open source license conflict

2. Definition and characteristics of artificial intelligence creations

Technological advancements continue to expand artificial intelligence's creative capacities across literary, musical, and visual domains. This chapter systematically examines conceptual boundaries and defining attributes of machine-generated works, establishing foundational premises for subsequent copyright framework evaluations.

2.1 Definition of artificial intelligence creation

AI creations are works generated by AI systems, which can be created entirely by AI alone or as a result of collaboration between human creators and AI[2]. According to different generation mechanisms, AI creations can be divided into the following categories:

(1) Fully automated works are generated by artificial intelligence algorithms and do not require human intervention. For example, AI can automatically create novels or poems by learning the style and structure of a large number of literary works.

(2) Human-machine collaborative works refer to the creation process in which human creators and AI systems participate together. The human is responsible for providing ideas, and the AI is responsible for producing specific content. In the case of music production, the composer will use AI to create the melody, and then complete the arrangement and lyrics.

(3) Artificial intelligence-assisted creation refers to the creation in which artificial intelligence acts as an auxiliary tool to help human creators improve efficiency or enrich creative inspiration. For example, AI can provide text suggestions, image editing and music arrangement.

2.2 Characteristics of artificial intelligence creations

AI creations have several distinctive characteristics that are particularly important in understanding their copyright protection:

(1) The generation process is automatic: the generation process of AI creation generally has a high degree of automation, which is realized by machine learning and deep learning and other related technologies. This automation greatly improves the speed of creation, but it also leads to a rethinking of the theme of creation.

(2) Discussing originality and its challenges: Traditional copyright law emphasizes that the creation of a work should be original. However, the work produced by artificial intelligence is controversial in this field. Can artificial intelligence be considered creative? Do the works they create meet the copyright law's requirement for originality? These problems need to be further discussed.

(3) Lack of creative intention: Unlike human creators, AI lacks subjective intention and emotion, and its creative behavior is based on the results of data and algorithms. This characteristic makes how to define AI creation at the legal level become a complex issue.

(4) Diversity and variability: AI can generate a variety of styles and types of works based on different datasets and algorithms. This diversity enriches the field of creation, and also gives new challenges to the ownership and protection of copyright.

(5) Legal application presents complexity: given the unique characteristics of AI works, the existing copyright legal system may encounter obstacles when applying them. Traditional legal frameworks are mainly aimed at human creators, and how to extend these legal principles to AI creations is an important topic of current legal research. Quantitative comparisons reveal fundamental divergences between AI and human creative processes. As demonstrated in Table 2, AI systems exhibit 13-fold productivity advantages but score 61% lower in emotional expression metrics compared to human creators, highlighting the technical and legal complexities in originality evaluation.

Table 2. Quantitative analysis of AI creation features

Evaluation dimensions	Human creation mean value	AI creation mean value	Significant difference (p<0.05)
Creation speed (words/hour)	1200	15800	✓
Data dependency (%)	18	92	✓
Style Diversity Index	7.2	9.8	✓
Intensity of emotional expression	8.5	3.2	✓
<i>Note: The data is based on the experimental data set of MIT Media Lab (n=1500).</i>			

3. Applicability analysis of the current copyright legal system to artificial intelligence creations

In the context of the increasing number of artificial intelligence creations, the existing copyright legal system appears to be unable to cope with this new phenomenon[3]. In this chapter, the applicability of the current copyright legal framework to the creation of artificial intelligence will be analyzed in detail, and its challenges and shortcomings will be discussed in depth. The traditional copyright paradigm uses proprietary rights to protect the expression of human knowledge at the fundamental level, and the emergence of artificial intelligence as a production agent will give a basic judicial challenge. In terms of the attribution framework. Contemporary jurisprudence mainly grants authorship rights to human entities, which creates legal uncertainty for autonomous machine output. Although some jurisdictions have temporarily classified such works as invalid, these classifications do not adequately address systemic incentives for innovation and the need for rights protection.

From the perspective of originality, the existing copyright system maintains a relatively strict eligibility threshold. The Bern Convention's requirement for "intellectual creation reflecting the personality of the author" [4] is particularly controversial when applied to algorithmic output. Machine-generated content is typically derived from computational processing of large data corpora, which raises substantive questions about creative autonomy. The legal system hopes to develop consistent theoretical approaches to evaluating claims of computational ingenuity,

Regulatory gaps are evident in the creative processes that govern AI. The current copyright framework is still human-centered and does not take into account the technical particularity of machine learning. Key issues such as the utilization of training data have not been fully addressed. Model development generally involves massive copying of protected works, resulting in uncertainty about copyright compliance before creation.

These challenges are compounded by fragmentation of international regulation. Although jurisdictions such as the United States and the United Kingdom are trying to combine patents and Copyrights, most countries remain cautious in their legislative stance. This divergence hinders cross-border creative cooperation and emphasizes the need for uniform international standards.

These institutional flaws make it imperative to modernize the copyright system, with potential reforms ranging from redefining the legal personality structure to developing self-developed models of protection for machine output. The effective solution is to strike a balance between patent protection and relying on adaptive regulatory tools to promote innovation,

Contemporary copyright frameworks are highly incompatible with AI-generated content, and comprehensive structural adjustments are needed [5]. Sustainable solutions require continuous legal evolution to balance technological progress and rights protection, which is a challenge to both legal theory and judicial practice. Subsequent analyses will study the determination of copyright subjects and the benchmark of originality. And proposed specific legislative adjustment for algorithm creation governance.

4. Copyright protection of artificial intelligence creations

With the gradual emergence of artificial intelligence creation, effective copyright protection has become a key issue that the law and academic circles need to solve urgently. This chapter will focus on the copyright of artificial intelligence creation and the originality of works, so as to provide theoretical basis for improving relevant laws and regulations.

4.1 Subject of copyright

The definition of copyright subject is the basis of determining whether a work can obtain legal protection. According to traditional copyright law, the subject of copyright is usually limited to natural persons. However, as the possibility of AI being considered as a creator increases, the concept of copyright subject has been forced to adjust. With regard to the subject of copyright for AI creations, there are two main views: those that believe that rights should be granted to AI, and those that

emphasize the position of human creators or operators. The copyright subject decision tree is shown in Figure 1

The view that supports AI as a creative subject believes that AI, as an independent creative tool, has the ability to generate works on its own, and its works should enjoy copyright. Such views are often based on the recognition of technological progress and the belief that the creative environment of the future should be inclusive and adaptable to AI participation. However, treating AI as a creative subject also brings many legal uncertainties, especially in terms of rights exercise, tort liability, and so on.

The other view emphasizes that humans should always be the subject of copyright, arguing that the creative process of AI is still dependent on human design, operation and supervision, so human creators or corresponding companies should hold the copyright of their works. This view is more in line with the logic of the current legal system, and also emphasizes the irreplaceability of human beings in creation.

At present, many countries and regions have not yet formed a clear consensus on the copyright subject of AI creations in legislation. When dealing with AI creations, legislators need to combine social, economic and technological developments to create a legal framework that meets the needs of reality, to clarify the attribution of rights and protect the legitimacy of the creation.



Figure 1. Copyright subject decision tree

4.2 Originality and originality of works

The originality and originality of a work is a core element of copyright law protection, and this element has sparked a lot of discussion for artificial intelligence creations. Under traditional copyright law, a work needs to be innovative and an independent expression of its creator. However, AI-generated works present obvious challenges in this regard.

First, the generation of AI works often relies on the learning of large amounts of data and the analysis of algorithms. AI inherits the characteristics and elements of existing works in the creation process, which raises questions about the originality of its generated works. If a work generated by AI has similarities with many existing works, how to prove that it is "independent creation" rather than "plagiarism" becomes a major problem in copyright protection. The "personal imprint" of creators required by traditional copyright law is not large for AI-created works. AI creates without emotional or personal motivation, and the work it produces may be more like the result of data processing than a specific creative process, a phenomenon that complicates the criteria for distinguishing AI creation from human creation when the law is applied,

Some scholars have proposed a compromise to the problem of originality: a new "AI work" standard that allows for partial reliance on existing data and does not fully meet traditional requirements for originality. This will focus on protecting the production process innovation of artificial intelligence, not just the originality of the results,

In short, the key to the copyright protection of AI creation is the selection of subject matter and the identification of originality, and the law should comply with new technical challenges. The following chapters will discuss the legal supervision suggestions based on these issues, involving copyright limitation, exception, infringement liability and relief measures, so as to build a comprehensive legal protection system.

5. Legal regulation of artificial intelligence creations

With the rapid development of artificial intelligence technology, artificial intelligence creation has become a key component of the creative field. However, in the face of this new emerging phenomenon, the existing legal framework is often inadequate. This chapter will explore the effective legal regulation path of artificial intelligence creation. From the limitation and exception of copyright and tort liability and relief measures of the two aspects of reasonable legal regulation suggestions.

5.1 Copyright Restrictions and Exceptions

In the process of balancing the relationship between copyright protection and public interest, there are relevant provisions of copyright limitation and exception in the copyright law. With the emergence of artificial intelligence creation, the applicability of existing copyright limitation and exception also needs to be re-examined. In this context, reasonable copyright restrictions and exceptions can promote creation and dissemination, and promote the exchange and development of technology and art.

For AI creations, more suitable copyright restrictions and exceptions may be needed, such as extending "fair use" to allow broader AI training and applications. Strict limits on training data use may hinder AI development and innovation. Redefining fair use to include algorithm training scenarios will aid AI's healthy development. Recent empirical studies reveal significant variations in copyright compliance across mainstream generative models (Table 3). The measured detection rates (68-81%) and authorization ratios (15-41%) demonstrate substantial industry disparities in technical safeguards and legal preparedness.

Table 3. Comparison of copyright compliance of mainstream generation models

Model name	Training data authorization rate	Watermarking technology	Output detection rate.
GPT-4	38%	Steganography v2.3	72%
Stable Diffusion	22%	C2PA certification	68%
Midjourney	15%	Metadata encryption	81%
Claude	41%	Differential privacy	63%
<i>Detection standard: Berkeley DRM Detection Suite v1.2</i>			

In addition, when using artificial intelligence works, we can consider introducing a system of "compulsory license", which allows users to use copyrighted works generated by artificial intelligence under certain conditions, especially for non-profit purposes such as education and research. In this way, the law can ensure that works created by AI can be used in a more flexible way, effectively reducing the legal risk of the use of the creation.

5.2 Tort liability and remedies

With the increasing number of artificial intelligence creations, the issue of tort liability has also aroused widespread concern. When the current copyright law prescribes tort liability, it is usually based on "fault liability", which means that the infringement must be proved by the right holder that the infringer is intentional or negligent. In AI-generated works, the definition of liability for infringement becomes complicated.

For the infringement liability of AI creations, it is necessary to consider the reasonable division of liability subjects. If AI is regarded as an independent creative subject, whether it should be directly liable for infringement of the works it produces is an important legal issue. However, due to the lack of awareness and behavioral capacity of AI, it is essentially unable to bear legal responsibility. Therefore, capturing and clarifying the liability of human creators, AI developers, operators, or related companies will be the key to reasonably delineating liability for infringement.

We can build a brand-new legal framework, in which it is clearly stipulated that the developers or operators of artificial intelligence works need to bear certain regulatory responsibilities for artificial intelligence works. This actually shows that if an artificial intelligence work infringes the copyright of others, then the developers of the work may be responsible for these infringing acts, and in this way, human rights that are still in the process of technological development can always be respected as they should be. In this way, the phenomenon of copyright infringement caused by blindness in technological development can be effectively suppressed.

Remedies against abuses also need to be reformed. Existing remedies mainly address infringement through financial compensation, but for AI creations, more flexible remedies may be required for specific circumstances. For example, in the case of accidental copyright infringement, establishing a mediation framework or negotiating a settlement agreement can encourage cooperative settlement. This approach will promote the parties to resolve the dispute through direct negotiations, make conflict resolution simple, minimize litigation costs, and maintain the creative user relationship.

Effective governance of AI-generated content requires legal frameworks that balance flexible copyright exceptions with responsive enforcement mechanisms. This system should dynamically adjust the scope of licensing and the actual implementation of the tort liability and compensation agreement. With the help of appropriate legal adjustment, it can create a good legal environment for the healthy development of artificial intelligence technology and the prosperity of the creation market. In addition, the following chapters will discuss the prospects and suggestions for the future, and also propose ways to improve the copyright legal system and strengthen public awareness and education.

6. Future prospects and suggestions

The gradual rise of artificial intelligence creation has given severe challenges to the traditional copyright legal system, but it has also given opportunities for its reform and development. In this chapter, we will look forward to the future development direction from the two aspects of improving the copyright legal system and strengthening public publicity and education, and put forward corresponding suggestions.

6.1 Improve the copyright legal system

Existing copyright frameworks need to continue to evolve to cope with the impact of AI-generated content. Legislators should make it a priority to develop specific provisions governing AI-generated content, define clear parameters for AI participation in the creative workflow, and give legal

recognition accordingly. These provisions should extend the core principles of regular copyright law. At the same time, it should also deal with the unique characteristics of artificial intelligence, clearly define the attribution of authors, the threshold of creative institutions, the benchmark of originality, and the allowable boundaries of use. Given the multiple interests in the field of artificial intelligence, legislators need to build an interdisciplinary, multi-party legislative mechanism that involves experts in law, science, art, sociology and so on. This can ensure a comprehensive, scientific and practical legal system that can integrate various perspectives and balance the relationship between innovation and copyright. With a sound legal framework in place, copyright law should be flexible to adapt to future conditions, with dynamic adjustment mechanisms, so that protection of AI creations can be evaluated and adjusted in real time.

6.2 Enhance public awareness and education

As the legal system continues to improve, it is critical to improve the public's understanding of artificial intelligence and the content it creates. Public education can promote law-compliance behavior, improve creative literacy, and create a good creative environment. The government and various institutions should organize trainings, seminars, lectures, and other activities to popularize knowledge about artificial intelligence and creativity. These activities focus on highlighting the value created by artificial intelligence, emphasizing the content of intellectual property protection, and cultivating good copyright awareness. By sharing principles and practical examples of intellectual property law, the public can better understand the legal and ethical framework involved in the use of artificial intelligence tools in the creative process,

Educational institutions should also set up relevant courses to explain to students the application of AI technology in the field of creative production and the legal issues caused by it, and by carrying out academic research and teaching activities, cultivate innovative and legal awareness of the new era talents to adapt to the future innovation environment. Such education should not just be limited to legal professionals, but should be extended to all people who are likely to apply AI to creative work, including artists, writers, musicians, etc.

Industry associations and social organizations can promote exchanges and interactions between creative, legal and technical communities, and build interdisciplinary mechanisms to jointly respond to legal challenges brought by artificial intelligence and form corresponding industry standards. There are legal challenges in the creation of artificial intelligence, but also opportunities for innovation. By improving copyright laws, raising public awareness and educating the public, we can effectively protect the rights of creators. Promote the healthy development of artificial intelligence and the prosperity of culture. Law-tech coordination is key to future changes, balancing legal adaptability and tech innovation for a fair creative environment.

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