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Research on the Copyright Ownership of Works Generated by Artificial Intelligence

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Abstract. With the widespread use of artificial intelligence (AI) in creative fields, the issue of copyright ownership for AI-generated works has become a topic of intense debate. This paper examines the copyright attribution of such works and the associated legal challenges. Current copyright law exhibits substantial deficiencies in addressing AI-generated content, necessitating a re-examination and adjustment of relevant legal provisions. By drawing on literature review, case studies, and comparative legal analysis, this paper investigates how different jurisdictions approach and implement legislation in this area. Besides, it develops a systematic framework for the copyright ownership of AI-generated content by analyzing established theories, real-world practices, and future trends, aiming to support the evolution of the legal framework. The analysis unequivocally establishes that artificial intelligence lacks legal personhood under copyright law and should be regarded as a creative tool rather than a rights-holding entity. In contrast, users play a decisive role in the creative process through inputting instructions and adjusting parameters. Therefore, copyright ownership of generated works should reasonably be vested in the users who exercise actual control over the creative process, rather than in the AI itself or its developers.

Keywords: Artificial intelligence, Copyright attribution, Generated works, Legal challenges

1. Introduction

The emergence of generative artificial intelligence (AI) is reshaping content production, extending creative horizons and enhancing efficiency. Yet, it also challenges the human-centered copyright system [1]. Traditional copyright law is grounded in human originality and personality, assuming creation by natural persons. Nevertheless, the absence of a human author in AI-generated works complicates copyright attribution. For example, the U.S. Copyright Office protects only works with human authorship, excluding purely AI-generated content. In the UK, copyright may be granted to the individual who initiated the generative process, though the required level of human input remains undefined. Existing research focuses on whether AI-generated works meet the copyright threshold, how to identify the rights holder, and how different legal systems respond in practice. At present, the U.S., Japan and the EU have taken initial steps in addressing the copyright status of AI-generated works, with Japan granting protection under certain conditions and the EU reinforcing it through directives. However, there is no global consensus, and legal interpretations vary widely. Therefore, this paper seeks to clarify the core disputes and legal challenges surrounding copyright

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attribution in AI-generated works. Through literature review and case comparison, it examines the legislative logic and judicial practices across different countries. It also explores how rights should be allocated in AI-driven creative activities amid the reconstruction of generative mechanisms and evolving subject relationships in law. The attribution of copyright in AI-generated works not only calls for adjustments to the existing legal framework, but also impacts rights allocation and industry practices. It is therefore urgent to address the legal challenges posed by technological advancement through sound theoretical analysis and institutional design.

2. Mechanisms of artificial intelligence creation and characteristics of works

The widespread use of AI in content generation has introduced fundamentally different creative mechanisms, enabling the production of text, images, and music with measurable originality. For instance, financial reports produced by Tencent's Dreamwriter have been recognized by Chinese courts as copyrightable. These outputs are typically automated, large-scale, and partially stochastic, generated by algorithms and data inputs rather than human intention or emotional expression [2].

2.1. Basic forms and applications of AI-generated works

At present, AI-generated content has been widely penetrated in various types of artistic creation, and its forms of expression show a high degree of diversification and technological integration characteristics. In the field of text creation, the natural language processing models represented by the GPT series can generate news reports, poems and essays, academic papers and even chapters of novels, like The Guardian, which once published a full-text review article independently authored by GPT-3, whose logical structure and linguistic style are highly convergent with those of human authors. In the field of image generation, technological breakthroughs have been particularly pronounced. Systems such as DALL·E and MidJourney are capable of producing visually coherent and stylistically rich works based solely on textual prompts. OpenAI's DALL·E 2, for instance, has generated surrealist artworks that have sparked authenticity debates in professional art competitions. Some commercial design firms have begun using such tools at scale for advertising illustrations and product prototyping [3]. In tandem with developments in visual content generation, music creation is advancing through algorithmic composition and audio synthesis. Platforms like Amper Music and AIVA can generate complete musical pieces based on user-defined parameters such as mood and tempo. A number of AI-generated songs have gone viral on streaming platforms such as Spotify, often without listeners realizing their non-human origin [4]. By training on large datasets of human content, generative AI has significantly advanced in language fluency, visual style, and emotional tone, increasingly replicating human-like form and aesthetics in text, images, and music.

2.2. Features and legal issues of AI-generated works

The inherently automated, random, and large-scale production of AI-generated content is reshaping the conventional copyright system based on human creators. The automatic nature of AI-generated content lies in its production by pre-trained models with no direct human involvement. For example, DeepMind's AlphaFold generates structural images from protein sequences automatically, making the process highly unpredictable and devoid of human control. The stochastic nature of models such as Stable Diffusion, driven by neural parameters and probabilistic sampling, results in outputs that vary greatly in composition and color despite identical prompts, making reproduction difficult and departing from the consistency of human creations. The large amount of performance algorithms can

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generate a huge amount of content in a very short period of time, such as Adobe Firefly daily average output of more than 100 million images, far beyond the limits of human creation. These inherent features of AI-generated content pose significant challenges to the traditional copyright doctrine of "originality." Automatism diminishes the recognition of intellectual effort, as illustrated by the U.S. Copyright Office's refusal to register the AI-generated comic Dawn of the Charybdis. In China's first AI copyright case, the court refused to recognize the work's copyrightability on the grounds that authorship could not be ascertained, demonstrating how stochasticity disrupts the causal connection between a work and its creator. Meanwhile, the large-scale output of generative AI creates practical challenges in attributing authorship and clearing rights, thereby complicating enforcement under existing legal frameworks. Furthermore, its depersonalized and decentralized nature challenges the human-centered basis of copyright law [5]. The growing complexity of rights between developers and users exposes the limits of existing frameworks like work for hire and corporate authorship, as algorithm-driven creation undermines traditional principles like identifiable authorship and the idea-expression dichotomy. In this context, reconstructing copyright logic is essential to addressing the legal challenges of technological change.

3. Copyright subjects of works generated by artificial intelligence

3.1. Traditional logic and institutional basis of copyright ownership

Traditional copyright authorship is rooted in anthropocentric legal doctrine, which fundamentally shapes the structure and logic of modern copyright systems. Article 3 of the Berne Convention explicitly requires that a work reflect "human intellectual creation," while Section 102 of the U.S. Copyright Act similarly limits the definition of "author" to natural persons. In Feist Publications, Inc. v. Rural Telephone Service Co., the U.S. Supreme Court further affirmed that a "modicum of human creativity," described as the spark of human intellect, is necessary to meet the threshold of originality [6]. This system protects not only the fruits of labor but also aims to incentivize human creative expression. In contrast, civil law jurisdictions place greater emphasis on the connection between copyright and personality rights. For example, German law mandates that a work exhibit "individualized intellectual creation," whereas French law conceptualizes a work as an extension of the author's personality. From an institutional perspective, since the 18th century, copyright law has been designed to establish a knowledge production order centered on human creativity. The Statute of Anne's restrictions on publishing monopolies and the idea/expression dichotomy both illustrate the law's enduring preference for human authorship. The law has traditionally excluded creations by non-personified entities. For example, the "monkey selfie" and natural phenomena were denied protection for lacking human intent and expression. Even in the era of AI, this legal rationale remains resilient. The preamble to the EU's 2019 Copyright in the Digital Single Market Directive explicitly states that only works rooted in human intellect qualify for copyright, reaffirming the centrality of human authorship amid technological change [7].

3.2. Impact of artificial intelligence on traditional copyright ownership standards

The absence of subjective intent and personal expression in AI-generated content underscores its depersonalized nature, challenging traditional standards for determining copyright authorship. The human-centric rights framework is inadequate for addressing content generated by algorithm-driven systems. For instance, OpenAI's DALL·E generates stylized images from simple prompts through data recombination and probabilistic modeling, absent of authorial will and thus failing to meet the

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requirement of personality. Consequently, such outputs cannot assume moral rights like attribution or integrity. Reflecting this logic, the UK Intellectual Property Office denied AI the status of patent inventor in 2022 [8]. In judicial practice, the traditional attribution logic is being challenged. While the U.S. Copyright Office rejects copyright registration for purely AI-generated works, standards remain inconsistent in human-AI collaborative contexts. In China's "Tencent AI Writing" case, the court recognized the work's originality but denied copyright protection due to the creator's lack of legal qualification, exposing challenges in applying existing laws to AI-generated content. In theory, there is a clear divide among scholars on this issue. Ricketson et al. upheld the "exclusive human authorship" doctrine, stressing the need to preserve legal stability and prevent expansions that could weaken copyright's foundational principles. In contrast, Margoni et al. argue for authorship based on actual control and intellectual input. The core dispute lies in whether existing frameworks can effectively address depersonalized creation, highlighting the traditional authorship rules' lag and normative gaps in the context of technological change. This divergence highlights the obsolescence of traditional authorship rules and regulatory gaps in the context of advancing technology.

3.3. Definition and limitations of copyright ownership in artificial intelligence works

The attribution of copyright in AI-generated works should uphold "human control" as a core tenet. To address rights allocation under emerging creative models, it is essential to redefine creativity standards, while affirming that AI lacks legal subjecthood. As artificial intelligence lacks both the capacity to assume legal responsibility and the ability to exercise rights independently, granting it the status of a copyright subject is incompatible with the fundamental legal principle that rights must be vested in entities with legal personality, making such recognition untenable in both legal and ethical terms. Ethically, directly granting authorship rights to AI often results in the actual benefits falling into the hands of developers, exacerbating the risks of technological monopoly while obscuring AI's reliance on human intellectual contributions. For example, DeepMind trained AlphaFold using vast quantities of scientific papers without providing compensation to the original contributors. As an alternative, Section 9(3) of the UK Copyright Act introduces the concept of the "person making the necessary arrangements," assigning rights to the natural or legal person who makes substantial contributions during the AI creation process. Ireland's 2023 legislation goes a step further, requiring that copyright claimants exercise "creative control" over aspects like model design, data selection, or output refinement. This institutional design reinforces human primacy while broadening the notion of "creative contribution." A similar position was adopted by U.S. courts in the "AI Art Exhibition" case, which affirmed that prompt engineering and stylistic integration can constitute a legitimate basis for copyright ownership. Moving forward, the core of copyright law should shift from the question of who created the work to who controlled the creative process, aligning legal frameworks with the technical realities of AI-generated content [9].

4. Legislative and theoretical issues of AI-generated copyright

4.1. Legal stances of major countries on copyright ownership

Major countries around the world generally uphold the "human authorship" principle in determining copyright eligibility for AI-generated works, though their specific approaches vary. In the United States, purely AI-generated content is explicitly excluded from copyright protection. According to the U.S. Copyright Office's 2023 guidelines, only the portions of a work that reflect substantial human creative input are eligible for copyright. For example, the U.S. Copyright Office rejected the

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registration of Stairway to Heaven, an image created solely by the AI tool Creativity Machine, but approved the parts altered by a human using Photoshop, demonstrating that only elements reflecting genuine human creativity qualify for copyright protection. The EU emphasizes the central role of human authorship in the selection and arrangement of material. Article 4 of the Copyright Directive on the Digital Single Market explicitly requires that a work reflect human creative intent. Likewise, in 2022, a Munich court held that a designer retained copyright for AI-generated furniture designs, based on their creative input in setting design parameters. Japan has adopted a technology-driven, gradual approach, with its 2018 Copyright Act revision introducing the concept of "quasi-works" to recognize user control over AI-generated content. In the "AI Novel" case, the Tokyo High Court ruled that the user's adjustment of model weights and selection of text demonstrated creative intent, thereby granting them copyright [10]. China's judicial stance remains inconsistent. In the Tencent AI Writing Case, the Beijing Internet Court denied copyright protection for an AI-generated article, whereas the Shenzhen Intermediate Court, in the "AI Advertising Copy Case," upheld the user's rights based on the originality derived from prompt design. On the whole, despite differing national approaches, the prevailing global trend is to uphold the central role of human authorship while increasingly recognizing "creative control" as a basis for copyright, in response to the challenges posed by AI to traditional legal frameworks.

4.2. Legal foundations and values of copyright ownership

Traditional copyright law takes incentives for innovation as its core goal, and its basic jurisprudence includes incentive theory, labour theory and property rights theory, but in the context of works generated by AI, this system is encountering profound challenges. Incentive theory rests on the idea that granting rights stimulates human creativity. However, since AI produces content without the need for compensation, it may instead erode the economic motivation for human authors. Labor theory holds that rights should belong to those who contribute labor, yet AI generation relies heavily on algorithmic training and large-scale data processing, making it difficult to align with Locke's notion of "mixed labor." For instance, whether the 46,000 hours of computing power used by Google to train its PaLM model constitutes "human labor" remains highly contentious [11]. Property theory asserts that creators should have exclusive control over their intellectual outputs. However, when AI-generated content is infinitely replicable, non-unique, and easily substitutable, traditional boundaries of rights become increasingly blurred. Moreover, AI creations lack the subjective intent, emotional expression, and value judgment inherent in human authorship. Their so-called originality is better understood as a probabilistic recombination of patterns rather than a true reflection of personal identity. In the AI Music Infringement Case, the U.S. Court of Appeals for the Second Circuit held that though the algorithm-generated jazz composition displayed formal artistic qualities, it lacked the "personal imprint of the author" and thus did not qualify for copyright protection. These tensions reflect a dilemma where strict anthropocentrism limits technological potential, while removing authorship thresholds risks undermining copyright's legal and ethical basis, calling for balanced reform.

4.3. Comparison of key perspectives on copyright ownership attribution

The current mainstream perspectives on the copyright ownership of AI-generated works generally fall into five categories. First, under the Public Domain Theory, AI-generated content is considered to lack human authorship and intent, and therefore should enter the public domain. However, this may lead to a "tragedy of the cultural commons," as seen in the widespread commercial use of

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MidJourney images without compensation. Second, the Developer Rights Theory emphasizes the creative effort involved in designing and training AI models, arguing that copyright should belong to the developers. However, it overlooks the user's control and choices during the generation process. This view was rejected by a UK court in the AI Code Case, which denied developers direct rights to the AI-generated output. Third, the User Rights Theory holds that prompt engineering and output selection constitute substantial creative input, entitling users to copyright. This approach has been adopted in countries like New Zealand, though a major challenge lies in defining the threshold of creative contribution. Fourth, the AI Entity Theory proposes granting AI legal personhood, but its lack of responsibility and intent renders it widely rejected. Fifth, the EU's Special Neighboring Rights Model introduces a sui generis protection period for AI-generated content. While it provides practical flexibility, it risks undermining the coherence of the broader copyright framework. Thus, the User Rights Theory and the Special Rights Model appear more viable, provided that a workable mechanism for assessing creative contribution can be established.

4.4. Institutional enhancement and standardization approaches

Legal reform should be grounded in the principle of human-led creativity, adopting a user-focused framework for assigning copyright based on three core criteria. First, the user must have a decisive influence on the final expression through cue design, parameter adjustment and result selection. For example, the U.S. District Court for the Eastern District of New York requires that prompts include specific instructions on style and composition. Second, the developer of the algorithm holds the patent for the model, but the copyright of the generated content should be attributed to the user if the developer is not directly involved in the creative process. Third, a contribution ratio mechanism should be introduced to allocate rights in collaborative scenarios based on the relative weight of data input and creative control. To support this framework, an AI-generated content registry should be established with mandatory disclosure of training data sources and human involvement. The Berne Convention should be revised to include a category for "computer-generated works" with a shortened protection term of 10 years. Additionally, fair use should permit non-commercial use of unregistered AI-generated content, balancing innovation and public interest.

5. Conclusion

To adapt to AI-generated works, traditional copyright must evolve, moderately expanding the notion of "creative contribution" offers a balanced path forward without disrupting legal stability. The results show that AI lacks legal subject status, so rights to its outputs should belong to the human exercising substantial control. Prompt design and parameter settings reflect intent and are key to determining authorship. A tiered copyright system is needed to grant limited protection to highly autonomous but original content, while preserving human creative primacy. Future research should advance in three key directions to address copyright challenges posed by AI. First, traceability technologies should be developed to verify human contributions and support rights attribution. Second, global AI adoption calls for an international copyright framework to reduce legal conflicts. Third, balancing long-term interests requires a fair and sustainable system that aligns the roles of creators, developers, and the public. Only by aligning legal and technological progress can copyright remain effective in the digital age.

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