



Research on Copyright Infringement Risks and Response Strategies of Generative AI

-- Taking Image Generative AI as an Example

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Abstract. The rapid development of artificial intelligence technology has led to the emergence of Generative AI (GAI), which shows great potential and application value in the field of image generation. However, the widespread use of this technology also raises concerns about the risk of copyright infringement. This paper aims to provide a comprehensive analysis of the challenges posed by image generative AI in copyright infringement, examine the underlying causes of infringement, and present effective strategies for addressing these issues.

Keywords: artificial intelligence, generative AI, copyright, innovation, legal boundaries

1 Introduction

The accelerated development of AI algorithms, arithmetic power and arithmetic data has resulted in the emergence of AI-generated art (AIGC), which is represented by AI creation (AI-generated art). This represents an important trend in the development of network information resources under the digital intelligence environment ^[1]. In this process, there has been a proliferation of AI cross-modal authoring tools, which have had a profound impact on the production structure and work mode of creators ^[2].

In the domain of image generation, Google introduced the 'deep dream' (deep dream) and 'style transfer' (style transfer) method in 2015, attempting to generate artworks through computer-based processes, a development that attracted considerable interest. Subsequently, the advent of DALL-E, Midjourney, and Stable Diffusion, along with other software, has precipitated a surge in the development of 'text-image deep learning models' ^[3]. The generation of images through the utilisation of vast data sets, coupled with the appropriate generalisation of AI, can result in the creation of original works. The utilisation of AI-generated images in conjunction with authentic originals within the realm of plausible yet not, has precipitated a surge in the capabilities of generative AI, propelling it to the forefront of technological advancement.

2 Image Generative AI Infringement Dilemmas and Case Studies

According to different task objectives and input modalities, image generation mainly includes image composition, the generation of new images based on existing images (image-to-image), and the generation of semantic-compliant images based on text descriptions (text-to-image). As the basis of image generation, AI technology is based on the learning of massive big data and attempts to simulate human thinking and decision-making behaviour to achieve creative production. Everything created by image-generating AI is based on human civilisation, is it a more advanced intelligent 'tailor' or an 'artist' with a unique style? Whether generative AI violates the copyright and intellectual property rights of the original work has become a point of contention in various circles.

In February 2016, Google Search and Gray Area Foundation (Gray Area Foundation, a non-profit foundation located in San Francisco, focusing on the cooperation between art and science and technology) jointly organised an art exhibition, called Deep Dream: the art of neural networks (Deep Dream: the art of neural networks). It is worth mentioning that all the artworks displayed in this exhibition were generated by artificial intelligence. Technically, all computer art, whether early computer graphics or contemporary AI art, is based on the manipulation and exploration of probability distributions [4]. As far as the artwork is concerned, it either uses image datasets to train various kinds of hidden spaces within generative adversarial networks, or it applies different thinking and concepts to explore the meaning of hidden spaces in visual art.

In terms of the artwork itself, the neural network creates the artwork based on its best computation, but it seems that every AI-generated artwork carries the shadow of other artworks, is it a secondary creation or a copycat? From the creator's point of view, is it the generative AI or the person operating the AI behind the scenes, or the millions of authors in the powerful database behind the AI training? Currently, generative AI has been successfully applied in painting, news writing, image generation and other fields, and the results are remarkable. The accelerated advancement of generative AI has precipitated a series of challenges pertaining to copyright infringement and user rights, which are pervasive across all facets of society. The law, as a subsystem of society, has been subjected to scrutiny in light of the transformative impact of this technological revolution.

2.1 Blurred Boundary Between Similarity and Copying

The Guangzhou Internet Court delivered a verdict in the inaugural case concerning the infringement of an AIGC platform. The plaintiff, Shanghai Xinchuanhua Culture Development Co., The Tab website, operated by the defendant, an AI company, provided AI drawing services that generated images that were substantially similar to images of Ultraman, thereby infringing the plaintiff's reproduction and adaptation rights. The Court ruled that the defendant should immediately cease the infringement and provide compensation to the plaintiff for the economic loss incurred, amounting to

RMB10,000 (including reasonable costs). Furthermore, the judgement serves as a precedent for infringement liability judgments on global AIGC platforms.

Broadly speaking, the right of reproduction refers to the right to change the form in which a work is presented without changing the main intention ^[5]. The two criteria for determining infringement of a work in judicial practice are accessibility and substantial similarity ^[6]. In the case of Ultraman infringement, Ultraman, as a well-known IP, has the possibility of being contacted, which is in line with the principle of accessibility; and in the determination of substantial similarity standard, the judgement is mainly based on the degree of similarity between the right work and the infringing work in the specific expression. The Copyright Law protects the external expression of the work, therefore, in judicial practice, the court generally compares the similarity of the content of the work to finally judge whether it constitutes infringement.

From the point of view of the path of deduction, there is an essential difference between the AI ‘Wenshengtu’ and the traditional infringement judgement route in the past. In the traditional infringement judgement, the defendant ‘reproduces’ the work of the power party due to direct copying, so it presents the characteristic of ‘similarity’, and thus is judged to be infringing; while in the AI infringement incident, the court generates the ‘similarity’ from the picture, and then deduces the ‘similarity’ from the AI to determine whether it constitutes infringement. In the case of AI infringement, the court deduced from the generation of pictures ‘similar’ to the original work that the AI ‘copied’, in which the decisive role of the ‘human’ subjective initiative and diffuse learning data model analysis of the generation of motivation there are significant differences.

2.2 AI Training Data Legitimacy is Unknown

AI as a learning technology, its training needs a huge database, but, AI model training material is reasonable use, is now quite concerned about one of the AI frontier legal issues.

First, at the input stage, the training data used by AI comes from various sources such as the internet, various databases, social media, news, books, and so on. However, not all of these training data come from the public domain, and some of the data come from certain databases, the use of which may be suspected of infringement. At the same time, there are a certain number of ‘orphan works’ (i.e., works whose authors are unknown or whose identities are clear but difficult to trace) in the database training. China's law does not make special provisions for the use of orphan works, and there are controversies in the academic community about the copyright infringement of orphan works, and there is no clear definition of whether it is legal to use ‘orphan works’ for training ^[7].

Secondly, although Article 27 of the Data Security Law of the People's Republic of China provides sanctions against illegal data acquisition, the large author group and high cost of searching for the source have made many AI developers choose to take the risk of ignoring the copyright protection and directly put their works into the database for training. At present, the GPT-4 algorithm model is still an ‘algorithmic black box’, and Open AI has not yet published an open source question bank. Secondly, the training

of generative AI algorithms is prone to the problem of illegal capture of personal data^[8]. On March 20, the open source library of Chat GPT had a loophole, which allowed some users to see the conversation content, name, email address, and even payment information of other users, which seriously infringed on the users' personal privacy rights.

Thirdly, Article 24 of China's Copyright Law stipulates that the utilisation of another individual's published work for the purposes of personal study, research or enjoyment is permissible without the requisite permission of the copyright holder. In the machine learning phase, generative AI identifies the underlying principles in the training data by classifying and clustering a vast quantity of data and refining the data features of different types of works. During this process, the computer will temporarily store and transiently reproduce the training data, and such temporary reproduction is usually automatically eliminated when the computer is shut down. As temporary reproduction does not meet the characteristics of reproduction in the sense of copyright law, it cannot meet the requirement of 'fixation' in a material carrier. Consequently, the question of whether generative AI belongs to the category of 'personal learning use' in the stage of machine learning remains a matter of debate.

2.3 The Conflict Between Copyright and Innovation

Copyright law is a product of communication technology, the emergence of new communication technology, will break the balance between the right holder and the user, and eventually produce new legal standards^[9]. In the data use of generative AI, it is necessary to obtain the authorisation of the copyright owner of the original work on a case-by-case basis and pay a certain licence fee in order to avoid the risk of infringement; however, in practical application, due to the sheer volume of data, it is very difficult for the data use of AI to fully obtain one-to-one authorisation from a large number of users, which makes it impossible for both parties in the transaction to make effective use of the work. At the same time, the use of generative AI data to pay the right holder, the use of data is very large and a wide range of types of wide range, which will generate a high licence fee.

Article 24 of China's Copyright Law states that, for personal study, research or enjoyment, the use of other people's published works can be without the permission of the copyright holder, but should indicate the author's name or name, the name of the work, and shall not affect the normal use of the work, and shall not reasonably prejudice the legitimate rights and interests of the copyright holder. For the current situation, the requirement of indicating the author's name and the title of the work has irreconcilable contradictions with the autonomous originality of the creation of the AI after the AI has carried out learning, which is difficult to apply to the data use situation of generative AI. Therefore, only from the perspective of copyright law, China's judiciary is not yet able to define new cases of fair use outside the existing category of 'fair use'. Therefore, in the absence of a separate legislative provision on the use of AI data, the use provisions of this article cannot be applied.

3 Image-generating AI Infringement Problem Cause Analysis

3.1 Insufficient Compliance of AI Training Data Collection and Use

Image-generative AI needs to collect a large amount of image data to train the model, which may come from different sources, including web crawlers, public datasets, user uploads, etc. The working mechanism of generative AI is to learn the distribution laws of the input data, and generate new data according to these laws. Since providers need to ‘feed’ massive amounts of data to master large-scale data pools^[10], it is sometimes difficult to completely avoid unauthorised access to original works that are protected by copyright as training or generative materials. Such unauthorised data crawling, regardless of the intention behind it - whether due to inadvertence or intentionality - may infringe on the copyright of the original creators.

Specifically, from the perspective of data crawling, crawling data from the Internet is the automatic extraction of other parties' data by one party through crawler software, which is manifested in the form of data crawling such as “web crawling” and “screen crawling”^[11]. Crawling data in violation of the agreement will not only constitute unfair competition, the use of crawler software may also increase the burden on the server, resulting in the normal operation of the website, if the rights holder caused losses should also bear the responsibility for infringement^[12].

AI's data resources may also originate from other platforms, such as the controversial case of Little Red Book and Trik-AI. One of the creators of a painting in that case claimed that Xiaohongshu may have provided his work to the AI model as learning material without permission. If Xiaohongshu did adopt the data within the platform and used these works for AI training without the creator's consent, then this behaviour may infringe the copyright of the original creator.

3.2 Legislative Vacancies and Regulatory Difficulties

Generative ai, as an emerging technology in recent years, has facilitated people's work and life. However, the current legal provisions related to generative ai lack clear definition. This makes it difficult to accurately determine whether a certain behaviour constitutes a violation of the law in practice. On the one hand, with the rapid development of artificial intelligence technology, AI-generated works are beginning to emerge gradually, and these works not only have unique artistic value, but also may be involved in a variety of fields such as commercial applications. However, the current copyright law lacks clear provisions on AI works and their potential infringement, which makes the application of the law ambiguous when dealing with copyright disputes involving AI works and makes it difficult to give a convincing ruling. On the other hand, the rapid development of AI technology has not only given rise to new forms of works, but also brought about new ways and means of infringement. These new infringement methods are often more hidden, complex and varied, bringing unprecedented challenges to the existing legal system. New ways and means of in-

fringement are emerging all the time, and it is difficult for the existing legal system to fully cover and effectively respond to them.

In addition to the legislative gap, the regulation of image-generating AI infringement also faces enormous challenges. The primary problem lies in the fact that the complex, changing and unpredictable nature of AI technology makes it difficult for regulators to accurately define whether an AI-generated work infringes on the copyright of the original work. Secondly, AI technology is widely popular and developing rapidly, however, in reality, there are limitations in the resources and capabilities of regulatory agencies, which often make it difficult to keep up with the fast pace of technological development. In addition, the regulation of image-generating AI infringement also involves data privacy, information security and other complex issues, which undoubtedly further exacerbates the difficulty and complexity of the regulatory work.

3.3 Weak Awareness of the Responsible Party

The manufacturing process of AI involves multiple participating subjects^[13], who work together to complete the design, construction, and support of the AI painting tool platform. Driven by image-generative AI technology, the threshold of creation has been drastically reduced, and the speed and scope of work generation and dissemination have been expanded unprecedentedly. However, some of the responsible subjects, including online platforms, social media, self-publishing media, advertisers, and some of the developers and users of AI technologies, have often become pushers of or participants in infringing behaviours due to a lack of sufficient legal awareness.

On the one hand, many responsible subjects lack in-depth understanding of the basic concepts and principles of copyright law and its practical application. In their pursuit of traffic, attention or economic benefits, they may inadvertently use AI-generated infringing works or intentionally disseminate infringing content, thus violating the law. On the other hand, driven by commercial interests, some responsible parties may intentionally ignore copyright issues and use AI technology to quickly generate or disseminate infringing works to attract more users or advertisers.

4 The Future Development Path of Image-Generating AI Outlook

4.1 Technical Innovation

With the continuous advancement of deep learning, Generative Adversarial Networks (GANs) and other technologies, image generative AI will be able to generate more complex, detailed and indistinguishable images. However, this technological advancement also comes with a higher risk of infringement. As a result, developers of AI technologies will have to face the problem of how to improve the quality of their generation while ensuring that they do not infringe on the copyrights of others. In the future, we are likely to see more algorithms and models being devised to optimise the diversity, uniqueness and innovation of generated images, while reducing similarities

with existing works. In addition, researchers will continue to explore how to embed copyright detection mechanisms in algorithms to automatically identify and avoid potential infringements while generating images.

4.2 Legal and Regulatory Level Improvement

At present, China has a number of laws and regulations on the content of generative artificial intelligence. For example, in September 2024, the State Internet Information Office issued the ‘AI Generative Synthesis Content Labelling Measures (Draft)’, which intends to stipulate that the generative synthesis services provided by service providers, including text, audio, images, videos, virtual scenes, etc., should be added in the appropriate location of a prominent prompt logo^[14]. When a service provider offers users the service of generating, downloading, copying or exporting synthesised content, it must ensure that the file in question contains a compliant and clear logo. Governments will need to develop or update relevant laws and regulations to clearly define copyright ownership, scope of use and liability for infringement of AI-generated images. The strengthening of legal regulation will be reflected in a number of aspects, including clarifying the legal status of AI-generated images, setting strict criteria for determining infringement, and increasing penalties for infringement. At the same time, the government will also promote the establishment of a cross-industry copyright protection mechanism to strengthen cooperation and coordination between different fields and jointly address the copyright challenges posed by AI technology.

4.3 Industry self-regulation and Establishment of Ethical Norms

In the field of image-generating AI, the strengthening of industry self-regulation will be an important means to reduce the risk of infringement. Preventing infringement is one of the key values of fault-based liability^[15]. Industry organisations will need to develop and implement a series of self-regulatory guidelines to regulate the behaviour of practitioners and improve the overall integrity and responsibility of the industry. These self-regulatory guidelines may include clarifying the scope of use of AI-generated images, restricting direct copying or imitation of copyright-protected works, and strengthening internal management and system construction. Through industry self-regulation, we can look forward to a healthier and more orderly image-generated AI market.

5 Conclusion

While bringing convenience and creativity, image-generating AI also faces the risk of copyright infringement. The risk of copyright infringement of image-generating AI can be effectively dealt with by strengthening copyright awareness and compliance training, adopting legally authorised data for training, clarifying the ownership of the generated images and the assumption of responsibility, reducing the risk of copyright infringement by using technological means, establishing a copyright dispute resolution

mechanism, and promoting the improvement of the legal system. In the future, with the continuous development of technology and the continuous improvement of the legal system, image-generating AI will play its great potential in a more standardised and safe environment.

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