



Innovation or Piracy? Empirically Demarcating AI Painting Copyright Infringement Boundary

Zihang Lan, Shuhan Yang, Rui Fan, Bo Zhao, and Yanru Yan^(✉)

Faculty of Law, Macau University of Science and Technology, Avenida Wai Long,
Taipa 999078, Macau SAR, China
1032026396@qq.com

Abstract. In the face of intense debates regarding AI painting copyright infringement, this study argues that AI painting should be considered a distinct art form that should be regulated separately from collage works because only the small-memory trained algorithm advanced to the algorithm creative stage, while the possibly copyright-infringing collage dataset did not. The sporadic occurrence of substantial similarity is attributable to the aberrant overfitting of AI painting algorithms, which will replicate the expression of the original work. If AI algorithm providers are aware of overfitting and do not attempt to avoid it or include additional filtering algorithms, it should be considered piracy. In contrast, other appropriately fitting AI paintings do not constitute copyright infringement since it is a process of integrating ideas rather than collaging expression according to the idea-expression dichotomy.

Keywords: AI Painting · Substantial Similarity · Idea-expression Dichotomy · Copyright Infringement · Overfitting · Stable Diffusion

1 Introduction

1.1 Background and Motivation

In August 2022, Stability AI company released Stable Diffusion Model [1], which enables non-painters to quickly and easily create high-quality paintings with prompts that meet their specifications. Subsequently, Stability AI raised \$101 million in funding and open-sourced the Diffusion model [2], highlighting enormous economic potential of Artificial Intelligence Painting (AI painting). In addition, other AI models, such as independent Midjourney platform, DALL-E2 model launched by openAI, and ERNIE Large Model released by Baidu in China, have a significant market share in the field of AI painting as well. Due to the rapid advancement of algorithms and emergence of the platforms mentioned above, AI painting has sparked a lot of public interest. According to Google Trends data shown in Fig. 1, the Web search index on “AI painting” legal issues increased by nearly 560% from July 2022 to January 2023. Furthermore, the topic of AI painting has been brought up on social media, with already 390 million people reading it as of March 2023.

Y. Shuhan and F. Rui—Co-second authors: These authors contributed equally to this work.

© The Author(s) 2023

N. Akhtar et al. (Eds.): PMIS 2023, AHIS 8, pp. 1328–1341, 2023.

https://doi.org/10.2991/978-94-6463-200-2_143

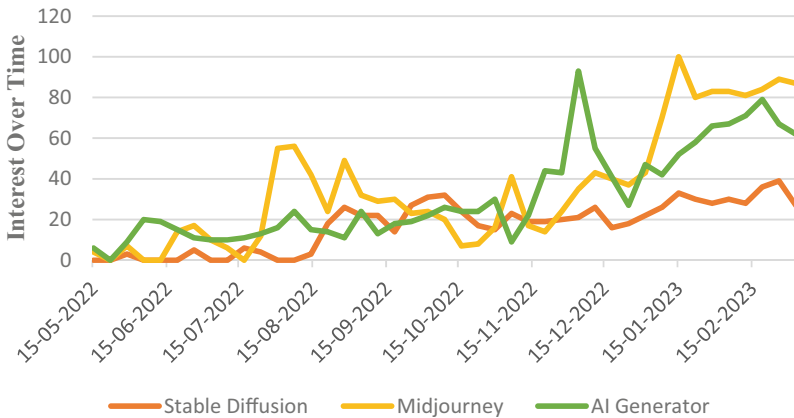


Fig. 1. Worldwide Legal Interest of AI Painting

There are both optimistic and pessimistic perspectives on the new issues brought about by AI painting. On the one hand, some people are receptive to AI painting. *Space Opera Theater*, designed by Jason M. Allen using Midjourney, won first place in an art competition. The judge did not recant after it won and it was revealed to be AI-generated because he believes there is nothing in the ruleset that would disqualify it [3]. Another illustration is the use of AI-generated artwork to quickly finish commercial manuscript assignments for profit, taking advantage of the ambiguity of copyright law and information asymmetry. These people have a generally favourable opinion of AI painting. On the other hand, some people, especially painters, have a negative attitude towards AI painting. Under the slogan “No to AI-generated images,” thousands of artists petitioned ArtStation, a community of the world’s leading digital artists and corporate teams, to remove AI-generated images that devalued the work of human creators [4]. Several painters have simultaneously asserted on social media that they didn’t give their permission for the AI to learn their works, but they later found that the AI-generated images were strikingly similar to their earlier works. Some of the AI-generated images even bear the signatures and watermarks of these painters [5]. AI painting resembles splicing or collage in comparison to human “painting” because it is based on massive amounts of painting data. The painters were angered by these infringements, and opposition voice remains strong. Some people believe that AI-generated paintings that lack originality are not artworks, and even refer to them as “corpse piecing together” and “digital stitching monsters” [6].

Currently, there is no provision in the Chinese legal system that can be applied to the above legal issues related to AI painting, which means that if there is a copyright dispute related to it, the fate of human artists and the commercial interests of AI enterprises will be in a state of uncertainty, and it will be difficult for judges to apply existing laws when rendering decisions as well. Against the above background, there are growing calls for suggestions on copyright legislation for AI-generated contents [7].

1.2 Related Work

As seen in Fig. 2, the copyright issue of AI-generated contents (AIGC) is one of the hottest topics in academic research on intellectual property from 2018 to 2022. Relevant study focuses on whether or not the AIGC has copyright and who owns the AIGC's copyright. Academic mainstream is that AIGC have copyright because they possess the fundamental features and originality of works [8,9]. Nevertheless, there are three primary perspectives on copyright ownership, including algorithm users as authors [10, 11], algorithm creators as authors [12, 13], and AI as “machine authors” [14, 15]. Several academics have also investigated whether AI is a fair use or an infringement of copyright during the training phase. The prevailing opinion is that the use of other people's copyrights for AI training input is a new sort of fair use of copyright since it fosters technical advancement [11, 16]. With the exception of the first two topics, however, relatively few scholars have investigated the copyright law mechanism and substantial similarities of nascent AI painting. Some believe that there is no distinction between AI paintings and other works, hence the general criterion “access and substantial similarity” may be used. Tu contends that AI may be utilised to fix the problems with the “substantial similarity” test for copyright infringement, making it possible for courts to decide copyright infringement in a more objective, fact-based manner [17]. According to ESPOSTI, to identify whether a new work is derivative of previous works, creative, or has a certain style, quantitative methods should be employed to analyse correlations between training sets and outputs created by computer processes [18]. According to Ligon, algorithm designers should review their finished AI artworks to see whether they are sufficiently transformational before releasing them to the public [19]. Guadamuz typically examines substantial copying of AIGC. According to him, for AI artworks, the substantial similarity must copy major visual features, and not simply a general style. Substantial copying is decided on a case-by-case basis, and the standard for judging copying infringement should be whether the exported works are substantially similar

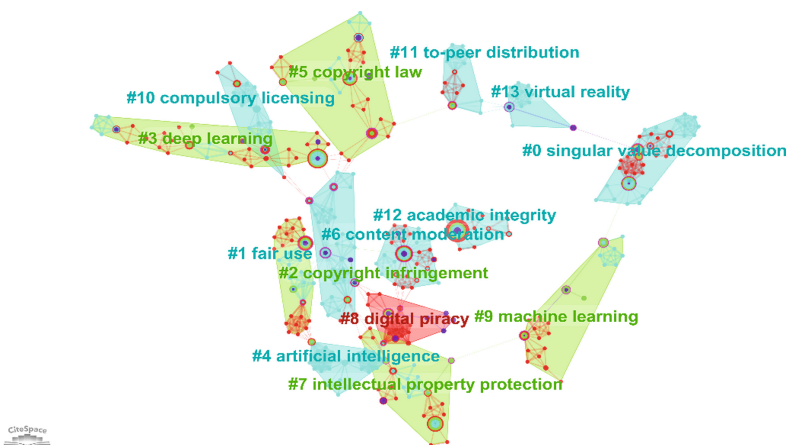


Fig. 2. AI Painting-related Literature Citespace Keywords Clustering Map

[20]. Tushar considers Generative AI models that replicate their inputs to be “overfitting” their training datasets, and AI developers often try to prevent that [21]. Sunray investigated the substantial similarity of musical compositions created by Generative Adversarial Networks, and he thinks that an ordinary listener should be able to determine whether the input material has been taken [22]. Wang Shengzhong believes that the AI-generated contents are random and uncertain, and it is difficult to prove that they constitute substantial similarities [23].

1.3 Research Objectives

Faced with the debate surrounding AI painting, copyright law must immediately adapt to the emerging public opinion and interest-based demands. Copyright legislation should not only assuage the concerns of artists and allow them to withstand the pressure of public opinion, but also safeguard the incentive of AI businesses to continue innovating. In this context, this paper’s objective is to answer the following questions: What is the AI painting mechanism? Should it be considered collage? In what situations might an AI painting infringe the copyright of a third party? How should copyright law address the potential infringement of copyright by AI paintings?

1.4 Research Methods

To fulfil the aforementioned study aims, this work primarily employs the following research methods:

1. Questionnaire Method: From January to March 2023, the author performed a nationwide poll on the contrasts between the essence of AI-generated content and human-created works. The author has received 766 valid questionnaires using “Questionnaire Star” by midnight on March 15, 2022, which includes respondents from the science and technology industry, the humanities and social sciences industry, and the art industry. The survey’s legitimacy and efficacy at a macro level make it representatively significant for examining and contrasting the fundamental distinctions between AI painting and human painting mechanism.
2. Interdisciplinary Analysis: In this paper, the theories, methods, and achievements of various disciplines, including AI model and copyright law, are employed to conduct a comprehensive study of AI painting as a whole, thereby resolving the problem that AI scholars are unfamiliar with copyright issues and intellectual property law specialists are unfamiliar with AI principles.
3. Historical Analysis: A history of technical advancement can be always seen in the century-long history of international copyright law. Guided by this principle, this study introduces and examines the evolution history of painting AI algorithm technology, analyses and compares the AI painting algorithm in different stages and mechanisms, and its corresponding diverse copyright regulations.
4. Hybrid Analysis. In this paper, an integrative and hierarchical hybrid analytic method is utilised to analyse the creation and output infringement. The “hierarchical analysis” distinguishes and analyses creation and output stage independently [24]. Integrative analysis, in contrast to “hierarchical analysis,” not only analyses the infringement

principles of each activity, but also investigates their relationship when investigating whether they are substantively similar. This paper will analyse copyright-infringing AI painting by combining the advantages of the two methods and discarding their shortcomings.

1.5 Contributions of This Research

This paper deeply clarifies the copyright law essence of painting AI algorithm mechanism, refutes the “collage theory” of AI painting widely held in public opinion and academia, creatively uses the idea-expression dichotomy to explain the overfitting phenomenon in AI painting, and delineates the quantitative boundary of AI painting copyright infringement. It offers clear guidelines for the establishment and implementation of AI-related legislation, safeguards the security and innovation enthusiasm of AI businesses, and encourages the positive interaction between technology and the digital economy.

AI artwork is selected as the penetration point of this paper’s copyright analysis because to the ferocity of the public’s criticism and the urgency of the artist’s requests. Legally speaking, there is no significant distinction between AI art, AI poetry writing, and AI programming. Hence, we may look at one spot on a leopard and visualize the whole animal. Taking into account the forms and features of distinct works, the conclusions of this study may be extended to resolution of various AIGC forms’ copyright issues.

2 AI Painting is Not Collage

2.1 Copyright Statutes Regarding Collage

This study clarifies whether AI paintings are collage works because distinct copyright restrictions apply to collage works and original works. A collage is defined as an artwork created by adhering several pieces together. If the collage material is protected by copyright and its use has not been authorized by original copyright owner, the collage works are at risk of copyright infringement. Nonetheless, collage works differ from plagiarism. Substantial originality, freedom of speech and cultural diversity advancement are the legitimate foundations of collage works. In general, amateur authors’ non-commercial creation of collage works constitutes fair use of copyright, whereas professional authors must be statutory licensed [25]. Although they are not required to obtain permission from the original author, they must compensate the copyright holder. If the AI painting is a collage, it should be regarded as a professional and profitable work, which is unlikely to constitute fair use of copyright. It must either acquire permission from the artist or pay the copyright holder if permission is not obtained.

No one, however, makes new works entirely from scratch, and some senior artists’ works are also influenced by what they’ve learned from their past paintings. Thus, the copyright law specifies the fair use of copyright for personal study and appreciation. The primary distinction between collage and learning-creation is that learning-creation involves extracting and analyzing the painting regularity of prior paintings, and then discarding the learnt paintings in order to begin creating afresh. For example, painters generally copy a model painting and compare with the original ones to analyse their

weaknesses, and then rectify and improve themselves in the following painting. Collage, on the other hand, is built on previous paintings and reassembled to create new paintings, requiring the artist to memorize related paintings and directly copy and paste them during the production process.

2.2 Evolution History of AI Painting

Painting by AI is not a creation of the twenty-first century. In reality, research on AI painting began early after the invention of computers. Harold Cohen designed the painting algorithm “AARON” in the 1970s, which is capable of producing an unlimited number of paintings in Harold’s own painting style. Instead of teaching the computer what to draw directly, he defines a set of drawing rules for computer creation and trains it continuously, then put to paper using a drawing robot. However, compared to recent generation algorithms, it lacks the ability to learn on its own. Although Harold’s algorithm model is inefficient and time-consuming, there is no risk of copyright infringement since the creator of the input work, trainer of the algorithm, and author of the output piece are the same individual. Besides the copyright risk, such cutting-edge technology at that time also brought other controversies to Harold. In the 1990s, when presented with the question of whether AARON is creative, Harold posed a query that remains unanswered as of today: “If AARON’s creations are not art, how do they differ from the real art? If it is not thinking, what is it doing exactly?” [26].

Following the introduction of Generative Adversarial Networks (GANs) in 2014, AI painting algorithms have undergone significant development. The process of GANs picture generation is a game between a Discriminator and a Generator. The generator is responsible for randomly generating new works from a given noise, while the discriminator determines if the new works fit human needs. All GANs have to do is to fool the discriminator, which makes it easy for AI to learn how to be lazy rather than input what people desire. Moreover, GANs has very strong autonomy, as its algorithm relies more on the confrontation game between Discriminator and Generator rather than the input copyrighted image data. Therefore, the parameters of GANs model are generally in the tens of millions, which is obviously light and convenient. On the one hand, the properties of the GAN model render the GAN-based AI painting effect undesirable and unremarkable. On the other hand, it minimizes the risk of copyright infringement. According to the relevant empirical model detection of the GAN algorithm, the typical functioning of GANs does not resemble one another significantly [27].

Based on the preceding research, we may conclude that AI painting does not involve separating and piecing together previously copyrighted content from the beginning, but rather calculates and outputs the image using an algorithm. Moreover, the copyright issue of AI paintings did not occur after the emergence of Stable Diffusion algorithms. Instead, it has garnered more attention due to the fact that the algorithm is more effective in practice and carries a greater danger of copyright infringement.

2.3 Copyright Explanation of Diffusion Algorithm

2.3.1 Stable Diffusion Explanation

Deep neural text-to-image networks that produce images from a trainset via an iterative denoising procedure are known as Stable Diffusion. As shown in Fig. 3, the diffusion algorithm adds noise to an image step by step until the whole image becomes white noise. This process is recorded and then reversed for the AI to learn. What the AI sees is how a picture full of noise gradually becomes clearer until it becomes a painting, and the AI learns to draw by learning this process of gradual noise removal. At authoring time, the AI predicts the possible noise based on the algorithm it has learned above, and then removes the predicted noise from the random noise map step by step until the output. The creation process of diffusion algorithm is similar to exhaustive method. If you ask a monkey to type on a typewriter for an indefinite amount of time and space, he will eventually type out the works of William Shakespeare. AI is born with the ability to draw anything, and the process of AI learning to draw is the process of understanding what humans truly desire, as opposed to simply assembling materials.

For instance, if we wish to generate images of huskies, the AI’s learning process involves generating a large number of images by itself and comparing them to images drawn by humans with husky tags. If they are comparable, they will be retained; otherwise, they will be eliminated. Ultimately, AI understands that when people assign the label husky, they desire a dog that resembles a wolf, has longer fur, erect ears, and kind eyes; AI will then generate a picture that matches these characteristics.

As depicted in Fig. 3, only the trained algorithm progressed to the authoring phase, whereas the potentially infringing dataset did not. This indicates that the algorithm of the final AI-generated artwork contains no original work or fragments of original work, but just the mathematical expression abstracted from the original work. According to the AI painting company’s description, the algorithm memory of steady diffusion is just 1.6GB, although the memory of its training set is 150TB [28]. Obviously, AI painting

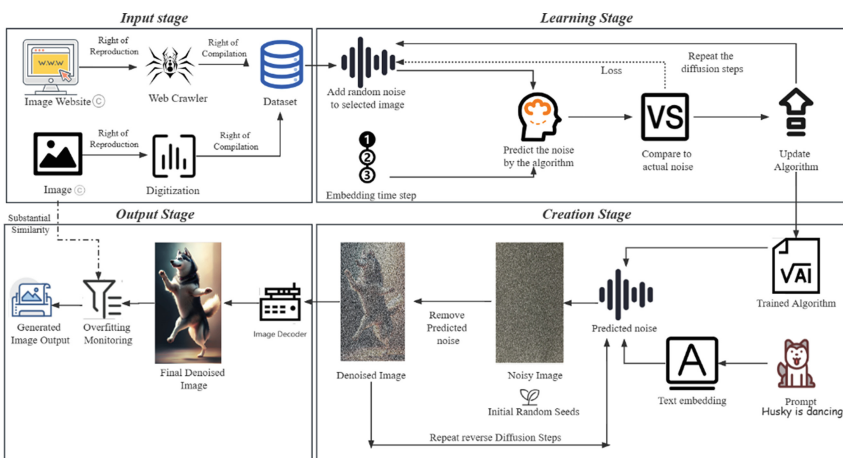


Fig. 3. Stable Diffusion Painting Flowchart

does not save information throughout the creative phase. Without storage, it is unlikely for the algorithm creator to teach the AI to collage the training set works, therefore the AI-generated works cannot be collage works. Naturally, the relevant regulations of the copyright law should not be applied to AI-generated artwork. Besides, some scholars are concerned that if two users use the same AI and database with the same text, the generated images might be substantial similar. However, the flow chart indicates that AI painting won't actually produce images that are remarkably similar again and over again. Random seeds that are of a very high order of magnitude are the foundation for the development of AI, and the random seeds are different every time a picture is created. Consequently, the generated images won't be substantial similar in normal situations.

2.3.2 AI Painting Copyright Legislation

As stated above, AI painting is not a collage; thus, what is AI painting? Is the creative process of AI comparable to that of humans? Should copyright laws provide AI creations the same standing as human creations? This research adopts the approach of empirical analysis to address these issues by mailing surveys to particular individuals. The primary components of the surveys are the respondents' industries and their perspectives on the fundamental distinctions between AI production and human creation.

A lower number on the graph indicates a narrower difference point between an AI drawing and a human drawing, while a bigger number indicates a wider distance opinion. As shown in Fig. 4, 73.57% of respondents believe that the creative process of AI paintings differs from that of humans and that it is challenging to perceive AI paintings as human invention. 26.43% of respondents stated that the creative process of AI paintings differs somewhat from that of humans and that AI paintings may be described as human creations. In contrast to the learning and creation process of humans, the random selection of fitting distribution after the mapping of words plays a crucial part in the final generation of AI paintings. It is quite difficult to compare this kind of machine probability-based random generating to human innovation based on personal emotional experience. This demonstrates that the majority still have doubts about the creative process of AI paintings, and it is not yet acceptable to accord AI creation the same legal standing as human creation.

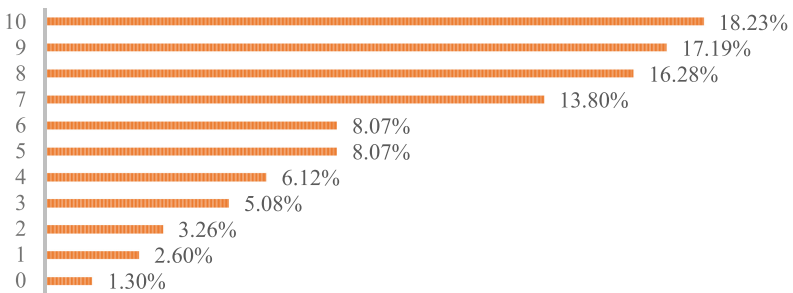


Fig. 4. The proportion of different opinions

Table 1. Analysis of Variance

Qu	Industries	Avg	Standard Deviation	F	p
Diff.	Science and technology	9.16	0.136	9.382	0
	Humanities and social sciences	9.26	0.146		
	Art	7.85	0.266		
	Other industries	9.38	0.844		

Regarding the distinction between human creation and AI creation, the F-value of the one-way variance test result is 9.382, corresponding to the p-value is 0. Under the assumption of a confidence interval of 0.05, it is considered that there is a significant difference between the groups. The score findings indicate that art industry practitioners believe that there is a considerable difference between AI painting production and human painting creation, but science and technology, the humanities, and other industries have a high degree of recognition for the AI creative process (Table 1).

3 AI Painting Should Avoid Overfitting

3.1 Copyright Law Intervention Point

The AI painting system generates pictures at a very high rate and in a very vast quantity, making it impossible to determine whether the outcomes are substantial similar. Hence, the traditional overall perception method is difficult to use in circumstances of AI painting infringement. In addition, once the AI algorithm has been released, the generated images is infinite. It may be deemed unreasonable to use a single infringing picture as proof against all other photos. Hence, each infringing image must be sued individually, and related litigation is prohibitively expensive. To address this issue, copyright law should concentrate on whether probable copyright infringement risks exist in the design and operation of AI painting algorithms, and whether the algorithm creator performs the obligation to prevent these risks.

3.2 Overfitting in Idea-Expression Dichotomy

In the preceding discussion, this study indicates that AI painting is not plagiarism as far as its underlying mechanism is concerned, yet AI painting may sometimes resemble the training set images considerably. Somepalli discovered that 1.88% of photos created using Stable Diffusion resembled in the training dataset with a resemblance of more than 50% [29]. These problems are often linked to anomalous overfitting in neural network algorithm.

Initially, we must comprehend the meaning of the overfitting algorithm in copyright assessment. When a machine learning system is fed several images of dogs but does not learn anything, it's called nonconvergence. When AI is capable of drawing an image, but

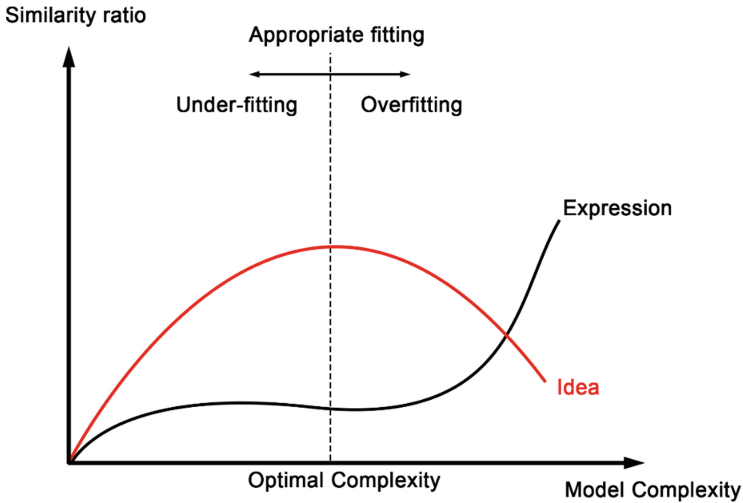


Fig. 5. Similarity Curves

it does not resemble a dog, it is an instance of underfitting, which relates to the model's inability to obtain decent results on both the training set and fresh samples. Overfitting occurs when an AI can only draw a white-haired dog after learning, but cannot even draw a black-haired dog. When a machine learning model properly predicts outcomes for training data but not for fresh data, this undesirable tendency is referred to formally as overfitting. The model "memorizes" the training set expression when overfitting, similar to memorizing every question when preparing for a test, but does not abstract the basic ideas.

As seen in Fig. 5, the vertical axis is based on the percentage of the number of substantial similarities, and the smaller the proportion of similarity, the less likely it constitutes infringement. The horizontal axis, which measures model complexity, simply quantifies the boundaries of idea and expression. At the underfitting algorithm stage, neither the ideas nor expressions of the original work have been learnt by AI. This level does not constitute infringement, but it does not fulfil standards as well. At the appropriate fitting stage, the algorithm only learns ideas, such as painting style. Due to the distinction between ideas and expressions under copyright law, this does not constitute infringement. During the stage of overfitting, the algorithm only learns non-essential details, which are exact enough to be identified as expression, probably posing a copyright infringement risk.

3.3 Coping with Overfitting

Typically, overfitting is caused by an uneven distribution of features across the training and new test sets, or by a model with an insufficient sample size and a high level of complexity. It is typically possible to be overfitting during training for a given artist due to the small number of images of the artist and the huge number of training steps. In this situation, the AI model can even output an image that is identical to one of its training

images. To address overfitting, we should also begin with these two factors. One strategy is to learn varied samples in order to lessen the substantial similarity of a single work. The other is to simplify the model, learn only ideas and keep the amount of expressions learned and iterations within a tolerable range.

The overfitting algorithms should be identified as copyright piracy. Overfitting algorithm has the risk of copyright infringement whether it is in terms of substantial similarity or the idea-expression dichotomy. Therefore, when judging whether a company's algorithm is infringing copyright, it should be checked by relevant experts whether there is overfitting in the algorithm. If there is, it will be determined that there is copyright infringement, because AI companies should be defined as Internet service providers rather than content creators, which is obliged to filter and review the works. It's worth noting that the algorithm infringes copyright only if the designer knows that the algorithm has overfitting and has the ability to avoid it. At present, it has been possible to monitor the copyright risk of AI painting models by member inference attacks.

If overfitting cannot be avoided, a quantitative substantial similarity filter algorithm must be included; otherwise, the little probability will also result in the proliferation of a large number of infringing works. For other substantially similar standards, such as quality standards and market competition standards, if it is possible in the future, AI can learn from human court cases on copyright infringement judgments, and filter infringing works based on the learned legal standards. Considering the current technology inability, it is impossible to impose excessive obligations on the current Internet service provider, so this study advises that other characteristics like as quality and market competitiveness be deduced only from quantity to achieve legal requirements, because according to our general experience, the lower the similarity between the generated pictures and the original training set in quantity, the lower the possibility of infringement in terms of quality and market competition. In balance, the quantitative aspect should give unauthorized algorithm designers a higher and stricter filtering standard obligation, which can encourage algorithm designers to adopt more technologically advanced deep learning algorithms and promote technological progress. Of course, this filtering algorithm also has certain defects. Because of the high proportion of substantial similarity, the parody works that are fair use due to the freedom of speech will also be filtered by the algorithm. This defect is a better choice under the balance of interests at present, and can only be gradually avoided with the progress of science and technology.

4 Conclusion

AI painting is not collage since it generates images from a trainset using an iterative denoising approach, which is the process of enhancing learning through feedback, followed by creation from scratch pursuant to the copyright law essence of painting AI algorithm mechanism. AI painting is a process of integrating ideas rather than collaging expression, hence AI algorithm providers are not required to seek permission from or compensate the copyright owners. According to the results of the questionnaire study, most individuals believe that the creative process of AI paintings varies from that of humans. Thus, we should not interpret AI paintings analogously to human works under the current copyright legislation.

AI algorithm suppliers may infringe the copyright of a third party if the AI painting algorithm is abnormally overfitting because it tends to imitate the specific expression of the original work. To address the potential copyright infringement by AI paintings in copyright law, this study suggests that AI algorithm suppliers have the obligation to monitor and minimize overfitting prior to outputting AI-generated artworks. If it is impossible to avoid overfitting, a stringent filtering method based on substantial similarity should be introduced.

References

1. Stable Diffusion Public Release <https://stability.ai/blog/stable-diffusion-public-release>
2. Stability AI Announces \$101 Million in Funding for Open-Source Artificial Intelligence <https://stability.ai/blog/stability-ai-announces-101-million-in-funding-for-open-source-artificial-intelligence>
3. Kevin Roose. An A.I.-Generated Picture Won an Art Prize. Artists Aren't Happy. *The New York Times*, Sept. 2, 2022. <https://www.nytimes.com/2022/09/02/technology/ai-artificial-intelligence-artists.html>
4. Eray Eliaçık. No to AI generated images: ArtStation protest explained. *Data Conomy*, January 5, 2023. <https://dataconomy.com/2022/12/no-to-ai-generated-images-artstation/>
5. Liu Yinheng. Or Involved in Plagiarism, AI Painting Savage Growth Appeared Hidden Worries. *China Youth Daily*, 2022-12-09(003). <https://doi.org/10.38302/n.cnki.nzqqn.2022.004169>.
6. Guo Jiyao. Stealing Art, or Redefining Originality? The Artistic Revolution and Controversy Behind AI Painting. *China Economic Weekly*, 2022, No.843(23):75-77. <https://baijiahao.baidu.com/s?id=1752002694575308052>
7. Zhao Chenxi. Legislation to Promote the Rapid and Healthy Development of Artificial Intelligence. *Legal Daily*, 2023-02-21(006). <https://doi.org/10.28241/n.cnki.nfzrb.2023.000900>.
8. Wang Siwen. Copyright Research on Content Generated by Artificial Intelligence. *View on Publishing*, 2022, No.407(05):64-68. <https://doi.org/10.16491/j.cnki.cn45-1216/g2.2022.05.013>.
9. Guo Wanming. The Legal Nature and Copyright Protection of Artificial Intelligence-Generated Results. *Publishing Research*, 2022, No.366(05):58-64. <https://doi.org/10.19393/j.cnki.cn11-1537/g2.2022.05.001>.
10. Zhu Lijun, Tian Rongrong. On The Copyright Issues of Artificial Intelligence Generated Content. *Shanghai Legal Research*, Volume 5, 2022:9. <https://doi.org/10.26914/c.cnkihy.2022.014714>.
11. Denicola, Robert C. "Ex Machina: Copyright Protection for Computer Generated Works." *Rutgers University Law Review*, vol. 69, no. 1, Fall 2016, pp. 251-288. <https://heinonline.org/HOL/P?h=hein.journals/rutlr69&i=261>.
12. Lin Xuebiao, Chen Yuanying. Discussion On the Copyright Ownership of Artificial Intelligence "Creations" And Countermeasures. *Cross-strait Legal Science*, 2022,24(04):67-72. <https://www.cnki.net/>
13. Bridy, Annemarie. "Coding Creativity: Copyright and the Artificially Intelligent Author." *Stanford Technology Law Review*, 2012, 2012, pp. 5-28. <https://heinonline.org/HOL/P?h=hein.journals/stantlr2012&i=140>.
14. Lan, Z. From Animals to Artificial Intelligence: Non-Human Beings' Intellectual Property Protection by "Judicial Capacity for Copyrights". *Beijing Law Review*, 13, 697-714(2022). <https://doi.org/10.4236/blr.2022.134045>.

15. Liu Ruixiang. Discussion on the Qualification of Artificial Intelligence Copyright Holders. *Journal of Hebei Software Vocational and Technical College*, 2021,23(04):68–71+76. <https://doi.org/10.13314/j.cnki.jhbsi.2021.04.016>.
16. Xuan Zhe. On the Reasonable Use of Copyrights Created by Artificial Intelligence from the Perspective of Classified Protection. *Publishing Research*, 2022, No.364(03):81–87. <https://doi.org/10.19393/j.cnki.cn11-1537/g2.2022.03.014>.
17. Tu, Shine Sean. “Use of Artificial Intelligence to Determine Copyright Liability for Musical Works.” *West Virginia Law Review*, 123.3 (2021): 835. <https://researchrepository.wvu.edu/wvlr/vol123/iss3/6>
18. 19. DEGLI ESPOSTI, M., LAGIOIA, F., & SARTOR, G. (2020). The Use of Copyrighted Works by AI Systems: Art Works in the Data Mill. *European Journal of Risk Regulation*, 11(1), 51-69. <https://doi.org/10.1017/err.2019.56>
19. Ligon, S. E. “AI can create art, but can it own copyright in It, or infringe.” <https://pattishall.com/pdf/2018-10%20Pattishall%20Insights.pdf>. Retrieved June 18 (2019): 2021.
20. Guadamuz, Andres, A Scanner Darkly: Copyright Infringement in Artificial Intelligence Inputs and Outputs (February 26, 2023). Available at SSRN: <https://ssrn.com/abstract=4371204> or <http://dx.doi.org/https://doi.org/10.2139/ssrn.4371204>
21. Tushar Gupta, Deep Learning: Overfitting, TOWARDS DATA SCIENCE (Feb. 12, 2017), <https://towardsdatascience.com/deep-learning-overfitting-846bf5b35e24>
22. Sunray, Eric. “Sounds of Science: Copyright Infringement in AI Music Generator Outputs.” *Catholic University Journal of Law and Technology*, vol. 29, no. 2, Spring 2021, pp. 185–218. <https://heinonline.org/HOL/P?h=hein.journals/cconsp29&i=428>.
23. Cover media, Ye Haiyan, Explosive AI painting caught in copyright infringement controversy (2022–12–15) <https://www.thecover.cn/news/v97IweQBr6CH90qSdq8Jkw>
24. Chu Meng. Challenges and Countermeasures of Artificial Intelligence to Copyright Infringement Liability System. *Northern Legal Science*, 2021,15(01):138–150. <https://doi.org/10.13893/j.cnki.bffx.2021.01.013>.
25. Hu Kaizhong. On the Legal Regulation of Remix Creation Behavior. *Law Science*, 2014, No.397(12) <http://rdbk1.yilib.cn:6251/qk/Paper/575971>: 89–97.
26. Harold Cohen. The further exploits of Aaron, painter. *Stanford Humanities Review*. Rev. 4, 2 July 1995, 141–158. <http://haroldcohen.com/aaron/publications/furtherexploits.pdf>
27. Webster, Ryan, et al. “Detecting overfitting of deep generative networks via latent recovery.” *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2019. <https://doi.org/10.1109/CVPR.2019.01153>
28. Novel AI. The Magic behind Novel AI Diffusion. Oct 20,2022. <https://blog.novelai.net/the-magic-behind-novelaidiffusion-b4797e0d27b2>
29. Somepalli, Gowthami, et al. “Diffusion Art or Digital Forgery? Investigating Data Replication in Diffusion Models.” arXiv preprint (2022). <https://doi.org/10.48550/arXiv.2212.03860>

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

