

# **Creativity Liberation Enabled By Infringement: Authorship and Copyright Issues of AI-generated Arts**

## **Abstract**

The AI image generator, which has attracted more and more attention since the releases of various powerful AI tool like Stable Diffusion, has aroused strong public interest and an upsurge of AI art creation. At the same time, the authorship of AI-generated images and the infringement issues that may be involved in the process of using AI tools have also triggered heated public discussion. This case study discusses this problem, demonstrates the legitimacy of the user having the authorship of the generated picture, analyzes all kinds of infringement problems that may be involved in the process of user input, model output and prepositioned model training, and confirms the substantive infringement in the process of stable diffusion model training. This article also analyzes the serious consequences of unauthorized use of human artwork as training data and its profound influence in the field of commercial painting, and calls on governments all over the world to regulate such acts in law to ensure that the legitimate rights and interests of human painters are protected.

## **Keywords**

AI image generation; copyright infringement; authorship; diffusion model;

## **Introduction**

In 2018, an AI-generated artwork “Edmond de Belamy” was successfully auctioned for about 3 million RMB(Cohn, 2018), despite constant skepticism, AI art production has begun to enter the public eye ever since. In the past years, a large number of text-to-image AI models have emerged from various companies and organizations arousing strong public interest. With the most recent emergence of Stable Diffusion and Midjourney, an upsurge of AI art creation has been brought, and even many artists have begun to try to use AI to assist art creation.

Users with no painting skills could simply use text prompt descriptions to make fantastic artwork in minutes, and the high quality of these artworks has made it possible to use them for commercial purpose(Ramesh, 2022). However, the more widespread the AI creative tools become, the more attention was attracted on the question of copyright issues of AI creations, especially when it is becoming increasingly common to use them in commercial context. AI-generated art introduces new issues regarding the authorship and originality of the artworks, “the use of copyrightable content as input data to train and teach AI to generate artwork, and the liability for AI-induced copyright infringements” are also becoming new concerns (Škiljić, 2021).

The core question this study tries to discuss is the authorship of AI-generated paintings and the copyright disputes and infringement practices that may be involved in this process. To better analyse the entangled status of such questions, the first focus should be the process of AI image generating itself. In this process, two steps are involved, one is the user input information including the text prompt or the picture prompt, and the other is the image generation

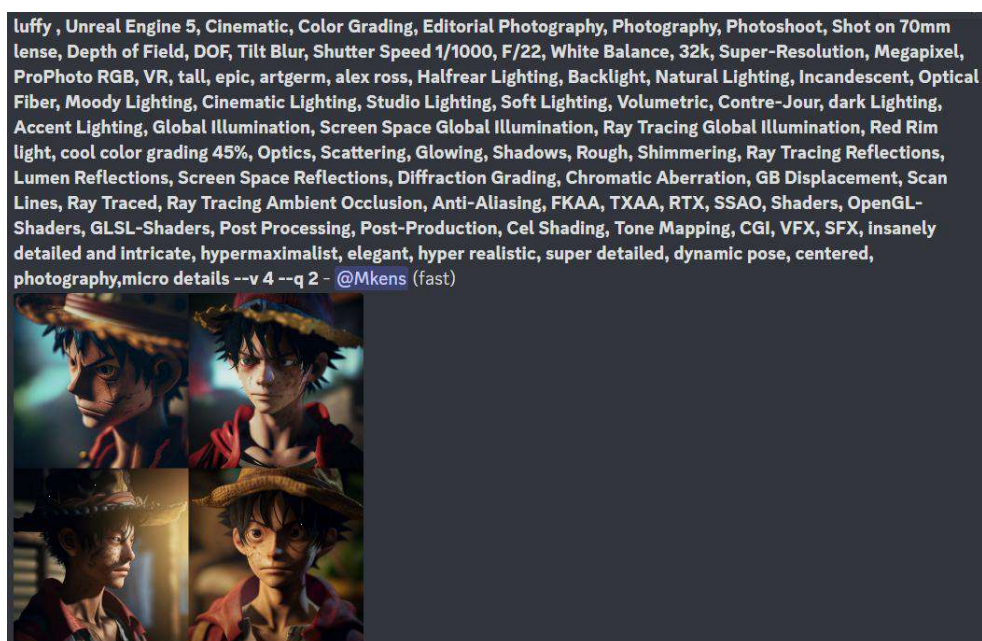
independently conducted by the model (Ramesh, 2022). Under the premise of temporarily ignoring other copyright disputes that may exist in the process of model training and implementation, the only parties referred to here are the user and the model provider. Therefore, we will analyze the authorship issue and the possible infringement issue of AI paintings from the perspective of the user inputs and the model itself / the model provider, respectively.

## **Creative authorship and copyright issue regarding user inputs**

As the primary starting point for this study, we explore the role of user inputs in clarifying authorship of AI-generated paintings and the possible infringement the user inputs might constitute.

### **Become the literary painter: Visual beauty as a result of intellectual engineering**

To better study the originality and authorship of AI-generated images, let's temporarily put aside other controversial factors in the implementing and training process of the AI model and simply regard the AI image generators as a kind of visual production tool to explore various factors affecting image generation.



*Figure 1. Impressive image generated by extremely complex prompts*

According to the interview and relevant literature, the current mainstream Image-generating AI tools are usually text-to-image tools, which generate images through text prompts input by users (Clarke, 2022). Some tool such as Midjourney also support the input mode of combining pictures and text prompts (Gitbook.io, 2022). According to personal experience of Allison, in order to generate a better quality image, it is usually necessary to modify the text input repeatedly and make more specific and targeted fine-tuning based on images generated in different stages. To obtain a more beautiful picture, the first step will be describing the content contained in the main

body of the picture, such as time and place and objects in it, so that the users can select good drafts in different proportions and scenes. Then further descriptive keywords will be added to enrich the details of the picture, such as the pattern of clothing, architectural style, the size of the characters, and so on. After determining the content included in the picture, you can also add stylized prompts such as "extreme detail", "3D rendering", "Van Gogh style" and other picture style and brush stroke features to adjust the overall looking of the generated picture.

Because of these features of AI tools, some experienced users gradually figure out how to use specific keywords to generate pictures with a specific style or characteristic, and produce a lot of very beautiful images that are comparable to the work of professional artists (See figure 1). These special techniques come from the constant exploration and familiarity of the AI tools, whose essence is an intellectual engineering process that adapts the organization of text to the output results of the AI tool. Even with the same tool, the quality of generated images could vary to a large extent as a result of different levels of user skills. This establishes a positive correlation between the user's skills and the production of pictures, which indicates that the most important factor affecting the quality of the production lies in the user's appropriate and skillful usage. Just as by using a pencil, users with higher painting skills can draw better pictures, in the novel context of image-generating AI, the user becomes the literary painter, and the visual beauty will be the direct consequence of such intellectual engineering process.

As the Court of Justice of the European Union defined that copyright applies to subject-matter which is original in the sense that it is its author's own intellectual creation, which were further defined as if the author was able to express his creative abilities in the production of the work by making free and creative choices (Böhler, 2017). The process of generating an image with AI tool definitely involves users' "free and creative choices" on compositing the prompts and keywords, thus the generated images should meet such originality requirements and the authorship should also be granted to the user who managed to create it by skillfully organizing the textual inputs.

### **Infringement induced by tool abusing and malicious guidance**

As for the copyright infringement that may be involved in user inputs, we discuss it separately through the types of user inputs. At present, the mainstream AI image generation model mainly supports two input types, one is text prompt, the other is picture prompt. For text prompts, as the text has no actual presentation in the final generated images, and from the generated picture itself the use of the prompt text cannot be reversely inferred (Alammar, n.d.), thus there is almost no possibility of constituting an direct infringement. Further more, per Allison's opinion, from the user's point of view, all the prompts and keywords inputs used to generate the picture are originally created and composed, which should be claimed with originality without any risk of direct infringement.

However, it becomes tricky to clarify when image inputs are used to generate the final picture. An intuitive association of infringement could be user using a copyrighted image as guidance image and moderating it with text prompt for a final output, but whether or not there is infringement been constituted actually depends more on the similarity between final output image and exiting copyright picture. If the final output image somehow managed to avoid constituting infringement, then the usage of copyrighted picture as guidance input should as well be exempted

from liability.

In addition, one particular kind of infringement problems that may be involved in user input seems to be an indirect misguidance and abuse (Wiggers, 2022). For example, intentionally generating copyrighted visual elements in the final output image by directly prompting with copyrighted icon or brand like “Winnie the Pooh”. But the infringement caused by this practice seems to be substantially conducted in the step of model image generation, while the user input may be accused of abusing or malicious guidance rather than infringement, and of course both are still restricted by the condition that whether the final generated image constitutes infringement.

In Allison’s opinion, assuming that when the pictures generated by AI are substantially infringing, it means the generated pictures and some existing artworks have a high similarity, that is, the essential reason for the infringement lies in their visual similarity. Though the process of using AI tools to generate pictures involves two factors, the part of pixel construction process to form the visual content is completely realized by AI, hence the model should intrinsically be the main factor constitutes the infringement, the liability of user inputs lies more in abusing and misdirecting.

As a conclusion, user input plays a vital role in generating high quality image in the context of AI image generation, an intellectual engineering process is involved in such situation, thus justifies the user’s authorship of the generated picture. The infringement problems that may be involved in user input are mainly focused on the use of copyrighted pictures as picture prompts and malicious guidance to generate copyrighted visual elements, but whether these two types of infringement are established depends on whether the resulting picture actually causes infringement, where user inputs both only play a role of indirect guidance in the whole process.

## **Copyright Issues Regarding The Model And Model Provider**

It is much more complex when probing into the copyright issues that might be involved with regard to the model and model provider. In order to better clarify the problems, it should be helpful to sort out the principles of how the images are actually generated for the mainstream image generation models.

### **Exempted From Identical Image Representation Due To Technical Principle**

When considering the copyright issue of AI-generated images, the primary and most direct concern is whether the AI will directly present the original pictures that already exist in its training set as the generated pictures. If such facts do exist, then there is no doubt that it would be an unquestionable infringement of the copyrighted original picture.

In order to investigate this problem, we first need to clarify the basic principles of the AI picture generator. Looking at the most famous and popular text generation image model like Stable Diffusion, Disco-Diffusion, Mid-Journey, DALL-E2 and so on, the academic literature published by these tools’ providers indicate that diffusion model are used as the core method in the field of text-to-image generation, and these tools are all based on different kinds of diffusion models to complete the image generation part in the process of text-to-image (Smith et al., 2022;Ramesh, 2022;Midjourney, n.d.).

As for diffusion model, there are mainly two processes, the forward diffusion process, and the reverse denoising process (Smith et al., 2022). The forward diffusion process mainly focuses on turning a picture into random noise, while the reverse denoising process is to restore a picture of random noise to a complete picture. The training and learning content of the diffusion model is how to generate the image data by reversing the random noise process (Ramesh, 2022). As shown in the figure below (See figure 2), the noise processing process is treated as a parameterized Markov chain that gradually adds noise to the image to make it fuzzy, and asymptotically leads to pure Gaussian noise in the end. The diffusion model learns to walk backward along this chain, gradually removing the noise over a series of steps to reverse the process (Dhariwal and Nichol, 2021).

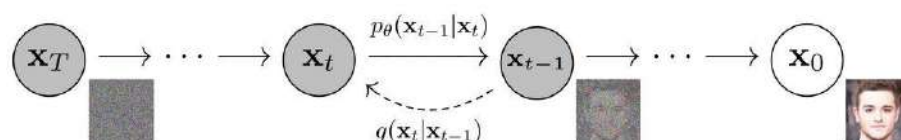


Figure 2. Process of denoising in diffusion model, Ho, Jain and Abbeel (2020),  
<https://arxiv.org/pdf/2006.11239.pdf>

However, it should be noted that the goal of this image reconstruction process is not to construct an autoencoder to accurately restore the image in a given embedding condition, but rather to generate an image that maintains the significant features of the original image in the latent space context (Nichol et al., 2021). For this reason, the process of generating images with such models is actually a process of noise reversal which rebuild the image pixels with latent space information converted from the user's input text. Hence, it is usually not a direct reproduction of the original training data, which should also avoid the indisputable infringement action of direct representation of copyright images (Ramesh, 2022).

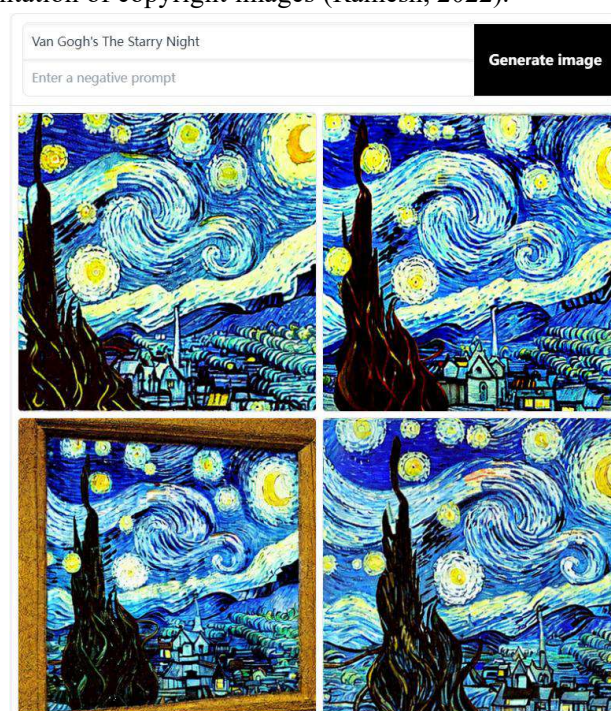


Figure 3. Images generated by Stable Diffusion with prompt "Van Gogh's The Starry night"



In order to verify this theoretical result, I used the prompt "Van Gogh's The Starry night", to generate pictures in Stable Diffusion and Mid Journey. The following is a comparison of the results generated and the original paintings (See figure 3, 4, 5). It can be seen from the comparison that although the pictures generated by AI are very close to the original picture in terms of composition and color, there are certain differences in the details. Therefore, we should be able to draw a conclusion that the pictures generated by AI rarely reproduce the original image as the final output.



*Figure 4. Original painting of Van Gogh's The Starry night.*



*Figure 5. Images generated by Midjourney with prompt "Van Gogh's The Starry night".*

## The Furious Unwitting Coaches

Though the behaviour of using AI model to generate images for commercial use seems relatively legitimate from the user's point of view, the copyrighted images used in the process of model training and iteration have led to a lot more controversy (Metz, 2022).

As mentioned by Allison in the interview, several of her favorite artists have expressed their dissatisfaction on social media over their works being used as model training data without authorization, which makes them feel furious but helpless, and similar situation was confirmed in CNN reports as well. According to Rachel Metz (2022), a group of artists were very angry that the images of their work were used without notice, consent or payment in the training of AI models. Erin Hanson, for example, has spent years developing her own distinctive color style and thick brush strokes to form her distinctive aesthetic features. But now, with simple keywords such as “in the style of Erin Hanson”, models like Stable diffusion can generate images that are very similar to her work in just a few seconds.

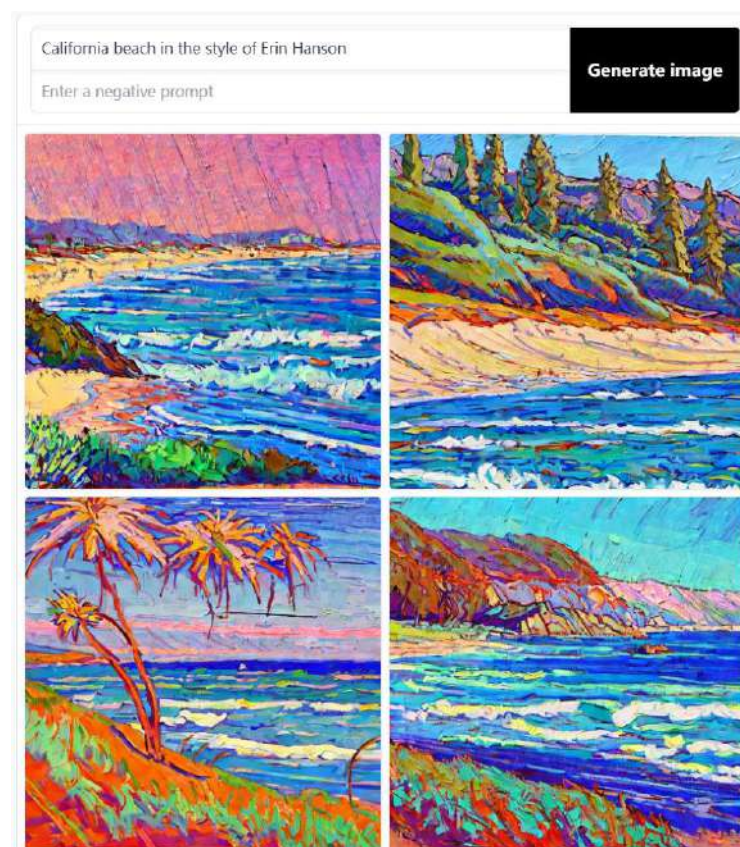


Figure 6. Images generated by Stable Diffusion with prompt “California beach in the style of Erin Hanson”.

To further confirm the content in this report, I entered the following simple text prompt "California beach in the style of Erin Hanson" on stable diffusion's online demo site and obtained a set of generated pictures as shown in the figure below (See figure 6, 7). Compared to one of the original works “Evergreen Coast” from Erin ([www.erinhanson.com](http://www.erinhanson.com), n.d.), the visual similarities between the two are apparent. Furthermore, according to the Stability AI, the



training dataset used by the stable diffusion model is LAION-5B. With the help of the data set retrieval tool provided by Andy Baio (2022), entering the keyword “Erin Hanson” can retrieve thousands of pictures of related paintings (See figure 8) in even a small proportion of the LAION-5B data set included in this tool (laion-aesthetic.datasette.io, n.d.), which proves the fact that stable diffusion uses copyrighted artworks for model development and training without permission.



Figure 7. Erin Hanson’s original work “Evergreen Coast”.

3,855 rows where search matches "erin hanson" sorted by rowid

Search:

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[Apply](#)

[View and edit SQL](#)

This data as [json](#), [CSV \(advanced\)](#)


Link	url	text	domain_id
8062		Lake Miramar San Diego local landscape oil painting for sale by artist Erin Hanson	www.erinhanson.com 3347

Figure 8. Retrieved Erin Hanson’s work in the training data set of Stable Diffusion.

However, the concept of painting style is vague and difficult to define in the scope of property right identification (Škiljić, 2021), which also leads to a fact that even if users use AI to



generate a work with a representative style of an artist, it is difficult to legally identify the existence of a substantial infringement relationship between the generated image and the original author's work. At the same time, as discussed above, the end user of the model usually pays a certain amount of intellectual engineering when generating the image, and some users even pay the subscription fee required to use the model. Therefore, from the user's point of view, the generation of such image should be considered legitimate as a result of using a specific kind of tool.

Hence, what we focus more here is the unauthorized use of copyright images for AI training, rather than the possible similarity between the generated images and the works of the original artist.

According to Allison, training an AI model for commercial use is definitely a company-based business behavior, if other's copyright work is used to create the company's product, especially when its purpose focuses on commercial profit, the usage of these works should be authorized and the original authors should be paid, otherwise it will constitute an infringement of property rights. This coincides with Škiljić's (2021) opinion of "Using existing paintings protected by copyright to train and teach AI without the authors' consent would violate the authors' copyright - certainly the right of reproduction and possibly the right of adaptation".

What's worse, training AI with human artists' work to produce specific styles of painting may lead to more serious social consequences. To reproduce a particular painting style is a quite difficult process for human painters, they need to first observe the works of the same style, then summarize the representative characteristics of composition, color, brush strokes and other aspects. Most importantly, human painters need to master a style of painting through continuous practice, it takes even longer exploration and practice time to form their own style of characteristics. The personal style characteristics evolved through continuous practice and improvement are one of the most important factors that constitute the core competitiveness of human painters. The style and distinctive personal characteristics which are hard to imitate is the reason why those artists with such stand out from the crowd. But for AI, given enough image data of the same style, it is capable of generating images that are very similar in style to humans after training, just as we have previously experimented with generating images of Erin Hanson's style. This will be likely to widely erode human painters' living space in the field of commercial painting, after all, a single painter's style and ability is always limited, and high quality paintings takes a long time to finish, while using AI to generate stylized images, have more style choice, more efficient product speed, and the price is much lower as well.

Worst of all, such unauthorized training behavior is difficult to be actually verified, especially in those models with undisclosed data of training sets, and there is no clear legal reference and effective coercive means to stop and protect their rights. AI tools from large companies, such as google and open AI, may be concerned due to their subjected supervision from all parties, but individuals and small companies that use open source code to train private models may be unbridled and have little real risk for them. Kim Jung Gi, a famous Korean artist who just passed away not long ago, whose work were found used to train AI models as data set without consent from his family or copyright owners to generate AI drawings with his painting style (Twitter, n.d.; See figure 9). Furthermore, this kind of event continues to take place involving famous artists such as Greg Rutkowski, Karla Ortiz and others around the world, result in growing anger and dissatisfaction from more and more artists.

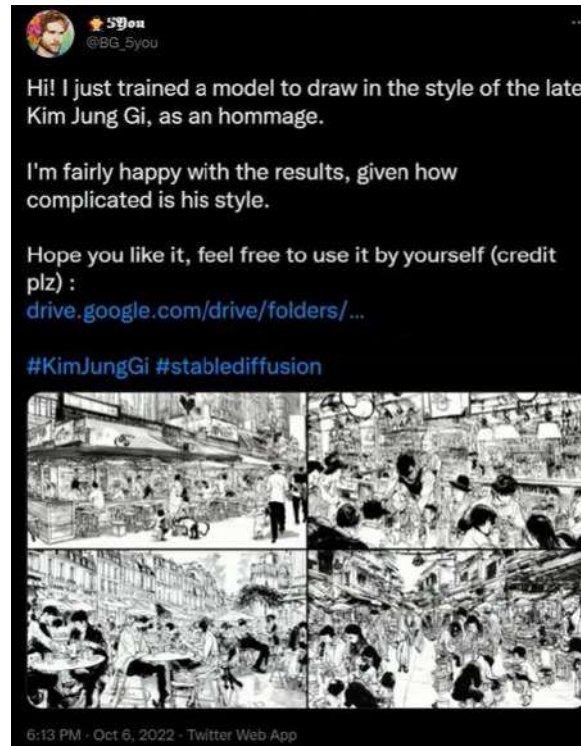


Figure 9. Unauthorized use of Kim Jung Gi's work as training data

## Conclusion

In a word, regarding the question of authorship of AI-generated images, as user input plays a vital role in generating high quality image in the context of AI image generation, an intellectual engineering process is involved in such situation, thus justifies the user's authorship of the generated picture and declares a shared copyright ownership of the generated image with the model provider.

As for the copyright disputes and infringement practices that may be involved in this process, the use of copyrighted pictures as picture prompts and malicious guidance to generate copyrighted visual elements are the major problems might occur with regard to the user input, but whether these two types of infringement are established depends on whether the resulting picture actually causes infringement, where user inputs both only play a role of indirect guidance in the whole process.

The situation is much more complex when analyzing potential copyright infringement practices on the model side. From a technical point of view, the current mainstream AI image generators are mostly based on the diffusion model to complete the actual pixel generation, so the generated image is usually not an identical reproduction of the original picture in the training data set, which avoids the most direct infringement of representation. However, the more controversial part is that the fact of model providers using copyrighted images for model training to implement their own image generation products. This practice itself constitutes an infringement to the copyright owners of these original images. What's worse, such behavior has more serious social consequences, eroding the living space of human painters in the field of commercial painting. In addition, artists who suffer from such violations, are difficult to prove it, and even if the empirical evidence is obtained, there is a lack of effective means to protect their

rights. Therefore, how to regulate the unauthorized use of other people's works in AI model training, how to define a widely recognized boundary, and how to safeguard the reasonable rights and interests of human artists, there is an urgent need for rational discussion from all over the world to obtain practical solutions.

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## Appendix

### Interview Consent



THE UNIVERSITY of EDINBURGH  
Edinburgh College of Art

SCHOOL OF  
ARCHITECTURE  
& LANDSCAPE  
ARCHITECTURE

#### Interview Consent

Name of Teacher: Professor Richard Coyne

Contact Details: richard.coyne@ed.ac.uk ph: +44 (0)131 650 2332)

Name, ID and email of the student conducting the interview:

Roger Liu, s2343291@ed.ac.uk, s2343291

*Thank you for agreeing to this interview. You will be asked questions about some aspect of your involvement with digital media. The conduct of the interview will comply with the health and safety rules that apply at the time and place of the interview.*

- This project is conducted by a student in the course ARCH11002/ARCH11080 Media & Culture and will form part of an assessed submission.
- Your interview will be recorded on video and with sound and may be edited.
- The material will be viewed by lecturing staff and may be used for instructional purposes in this or future years.
- The material will only be available as course content restricted for use by students in this course and will not be made public without your permission.
- Note that you can withdraw from the interview and terminate the process at any time before, during or immediately after the interview.

Please sign this form if you are 18 years of age or over and consent to be recorded as outlined above.

Name of person being interviewed: Yuqingying Mu

Signature: Alison Mu

Contact email: s2414035@ed.ac.uk

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## **Interview Questions**

1. Which image-generating AI have you used?
2. What kind of input data the AI model you used accepts? Only text prompt or something more?
3. Do you think it is easy to generate an image that satisfies your needs?
4. Under the premise of using the same AI tool, what do you think are the decisive factors that affect the quality of AI generated paintings?
5. Do you agree that if the AI is trained with some other artists' work to make it capable of generating paintings, these artists should be paid or compensated? Either way, please explain why you think so.
6. Take text-to-image as an example, if the AI drawing infringes the intellectual property of existing visual images, which party do you think should be responsible, the AI model user or the AI model designer/implementer? And why you think so?
7. Do you agree that AI drawing will gradually make human painters lose their competitiveness in the field of commercial drawing? Or at least part of the human painters?