AI and the Shifting Image-making Landscape

A Master's Thesis by
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Presented to the department of Photography in partial fulfillment of the requirements for
Master of Fine Arts in Photography and Image-making

PARIS COLLEGE OF ART
January 2023

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Abstract

This thesis examines how Artificial Intelligence is changing digital image-making and how artists adapt and transfer their skills to this new technology. To examine this shift, we look into the history of technological shifts and art. We examine three case studies of AI artists who are producing contemporary work. We examine some of the possible problematic issues related to AI as we examine these case studies. We expect to see the current state of AI technology's impact in the field of image-making. AI has many negative connotations related to it as AI makes its way into societal discourse. We aim to demystify these misconceptions by stating what it is and what it is not and show how AI is being developed and used. We look to show how AI tools will change the professional art making landscape.

Key Words

Artificial Intelligence, text-to-image AI, Image-to-Image AI, Generative Adversarial Networks (GAN), Midjourney, DALL-E, Rogers Adoption-Diffusion

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Introduction

Going once… Going twice… SOLD! For 350,000 euros…

On October 19, 2018, an anonymous bidder phoned in the winning bid for an art piece that was created by the Obvious Art Group using Artificial Intelligence (AI).[1] AI-assisted art production had symbolically arrived as a major player in the art market. This phenomenon marked a small pole shift in the art world—a sign of the significantly growing interest on this kind of work, as well as its newly increased value. Martin Ford in the book *Rise of Rise of the Robots* anticipates a second technological revolution that is powered by AI.[2] He believes that AI will be replacing many professions including those in the art field. This brought many questions to the forefront. What is Artificial Intelligence? How is AI being used to make art? Is AI autonomously making new work or is it being co-oped by a new avant-garde? We will examine these questions and challenge the implications of the title given to this technology. The name of this technology implies an intelligence that many associate a negative connotation: yet in our research we have found AI is not autonomous and specifically looks at how it is being used today as a medium of expression for artist.[3] AI text-to-image generators are becoming more powerful and relevant for image-making. By examining this technology's evolution and applying it to the Adoption-Diffusion model by Everett Rogers, we can get a clear view of how far this technology has come and gain perspective of its effect on the creative process.

To understand how AI influences art (and more specifically image-making), it is useful to have a basic understanding of AI and its development. Artificial Intelligence is a computer that is programmed to process and synthesize a large amount of data rapidly enough that it enables the system to make independent decisions in order to produce a desired outcome. This computer has two programs that runs in tandem: one that is a producer and the other as the authenticator. The production program makes an image and the other verifies the result is

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[1] Gabe Cohn, "AI Art at Christie's Sells for $432,500," *The New York Times*, October 25, 2018, https://www.nytimes.com/2018/10/25/arts/design/ai-art-sold-christies.html.

[2] Martin Ford, Rise of the Robots: Technology and the Threat of a Jobless Future (New York: Basic Books, 2016).

[3] Vladen Joler and Matteo Pasquinelli, "The Nooscope Manifested: AI as Instrument of Knowledge Extractivism," Nooscope (KIM HfG Karlsruhe and Share Lab, May 2020), https://nooscope.ai/.

accurate to the request made. These dueling programs are called a Generative Adversarial Network (GAN).[4] As the computer goes through each iteration it is going through a type of computer training in which each iteration is getting more accurate with each run. This program is allowed to make changes to the image to be more aligned with the request being made. This decision-making process is considered to be Artificial Intelligence because of the analysis and reengaging of making that happens in the process. It is also referred to as machine learning because with each new iteration the machine learns to be more accurate in its production.[5] In our research, it seems to be debatable if allowing a program to make decisions independently is a measure of intelligence or clever programming. However, one of the common goals in developing early computers has been to create a computer that mimicked human intellect and skillsets.[6]

Computing technology began to advance in the early twentieth century as mathematician Alan Turing and neurologist Grey Walter contemplated the idea of an intelligent machine. Walter was developing some of the first robots and concurrently Turing developed the now famous Turing Test in 1942.[7] This test "set the bar for an intelligent machine: a computer that could fool someone into thinking they were talking to another person."[8] This is one thing, yet it is another for a machine to have the capacity to learn. In 1959, Arthur Samuel proclaimed that he was able to develop a machine that had the capacity to learn calling this "machine learning."[9] His claims were centered around a program that he said "will learn to play a better game of checkers than can be played by the person who wrote the program."[10] We start to see computer programs dip into the realm of art production with the development of a program in 1973 called AARON by Harold Cohen.[11] This program has autonomously created abstract images for decades. This program follows an ever-changing protocol in order to create unique pieces with each iteration.

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[4] Joler and Pasquinelli, "Nooscope."
[5] *ibid.*
[6] *ibid.*
[7] Benney Kistler and Pete Kistler, "Timeline of AI Art," AIArtists.org, 2022, https://aiartists.org/.
[8] *ibid.*
[9] *ibid.*
[10] *ibid.*
[11] *ibid.*

The central technology that enables AI in its ability to assist artists and photographers is Image Recognition Technology (IRT). IRT is a computer's ability to accurately identify subject matter by analyzing image information at the pixel level. The major breakthroughs came in 2009 from the researcher Fei-Fei Li. Li established a free database of over fourteen million images that were categorized by their content. This represented a major leap forward because a database of this scale had never before existed as an open sourced resource.[12] AI needs a large amount of data in order to be trained. Having a free database enables the AI system's development to rapidly update because the necessary data needed for training the system does not need to be curated—a costly and time-consuming operation. This database democratizes AI systems development and opens it up for further development by many more engineers who are interested in the field. Another exciting development came in 2015 with the development of Google Deep Dream, a program which constructed images of hybrid animals like a Camel-Bird and Dog-Fish.[13] These psychedelic images were coined as a new style of image called "Inceptionism." AI artwork is becoming more and more prevalent in the art community with each passing year. We see AI art winning prizes, gaining market value, and being exhibited in more and more forums.[14]

AI technology raises many questions when it comes to art making. Is the resulting image that comes from an AI computer a relevant addition to the canons of art? If the computer is making the artistic technical decisions in the art making process, can the result be considered art? These considerations are similar to another innovation that impacted art in the mid 1800s. With the advent of the camera, artist and critics alike contemplated the impact that machinery could have on artistic expression. This new medium challenged the ideas of what art was and could be. We look at what critics and artists said in the nineteenth century about the development of photography and examine this as a parallel to what is being said about AI generated art in the present. This parallel is drawn in an effort to highlight the relevance of innovation as we welcome AI tools into art production as well as highlights a significant threshold in the Adoption-Diffusion model.

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[12] Kistler, "Timeline."

[13] *ibid.*

[14] Kevin Roose, "An A.i.-Generated Picture Won an Art Prize. Artists Aren't Happy.," The New York Times (The New York Times, September 2, 2022), https://www.nytimes.com/2022/09/02/technology/ai-artificial-intelligence-artists.html?smid=em-share.

Many artists are challenging themselves by using AI as a new medium of expression. We look at cases studies of artists that are utilizing AI image-making tools and show how they are curating a set of images that were created by AI for exhibitions. For example, Rashed Haq is using his own curated database to construct portraits of people who do not exist. He is actively thinking about and pushing the limits of what photography can be. The Obvious Art Group used a database of historical European portrait paintings to develop a fictitious family named the Belamys.[15] This series of portraits was rendered in a painterly way and ended up selling for an astounding amount at the Christie's auction house in Paris, France. These artists are just a few examples that support the idea that AI is not autonomous and is assisting contemporary artist in developing their concepts. These artists are a part of a new avant garde in digital media and represent a maturing of AI as an artistic medium.

Art tools using AI in image-making are rapidly developing and the artist's role in the making process are in question. There are clear signs that point to the current state of AI image makers as we examine where AI text-to-image systems are in relation to Everett Rogers' Adoption-Diffusion model. AI has evolved to a point where artists will be utilizing it to express themselves in mass. New skills and methodologies will be necessary as this new paradigm takes hold. In this thesis, we will examine the creative process and see how AI will add to it in a meaningful way. This means AI will be changing the role of photographers and will also effect the jobs they will be asked to do. We will look at this change in landscape and highlight how AI will make its presence more applicable.

[15] Pierre Fautrel, Hugo Caselle-Dupré, and Gauthier Vernier, "La Famille De Belamy," Obvious-Art, Accessed April 25, 2022, https://obvious-art.com/la-famille-belamy/.

Chapter 1: Art and Mechanical Innovation

AI's leap into the realm of fine art image-making is contributing to a new form of expression as we see a genre of digital art beginning to mature. This budding expression is encouraging the cultivation of new techniques to be explored as the human imagination and AI become more intertwined. A mark of a developing society is its constant push for innovation. Ever since the computer was invented one of the design goals was to mimic human intelligence. Today, AI's progress is due to better processing capabilities and more robust databases. AI's arrival in many different fields has been marked with criticism, fear, and with some exhilaration.[16] Examining it budding presence in the world brings up many topics of discussions and debates.

What marks human intelligence? Is it specific like human's ability to use language to communicate ideas? Maybe it is the human's ability to understand and compute advanced math problems. One thing is true, the mark of human intelligence is more complex than zeroing in on one area of interest for the human mind and determining intelligence based on mastery in such a narrow scope.[17] As diverse as we are as humans, our intelligence is defined in different ways and is also defined by different standards. One of the main areas of human intelligence comes from the ability to see and process information. "We humans are highly visual animals. Almost fifty percent of our neocortex—the part of the brain that arrived latest in evolution and hence is most characteristic of primates—is dedicated to vision. Vision is so integral to our understanding of the world that the ability to 'see' means not only to decode light signals but also to comprehend the thrust of a verbal argument."[18] This ability to see is vital to examine in this research because it is one of many key components that assist image-making artists in their efforts to create. For AI to be considered a valuable addition to the image makers tool kit, it must first develop and perfect its ability to see and interpret. The more recent (2022) advancements in digital imaging technology and the recent availability of image rich databases have enabled huge steps forward in our ability to teach a computer to

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[16] Geoffrey Batchen, "Phantasm: Digital Imaging and the Death of Photography," *Metamorphoses: Photography in the Electronic Age* 136 (1994): pp. 46-51, https://www.jstor.org/stable/24472491.

[17] Anya Hurlbert and Tomaso Poggio, "Making Machines (And Artificial Intelligence) See," *Daedalus,* The MIT Press on Behalf of American Academy of Arts & Sciences, 117, no. 1 (1988): pp. 213-239, https://doi.org/193.56.117.222.

[18] *ibid*

see. What does it mean to have a computer see? What can a computer do with sight? Our ability to use this sense as humans helps us to do many tasks. For instance, on a basic survival level it enables us with the ability to distinguish friend from foe. From an artist perspective, it allows us to see if an image is satisfactory or if it needs more work. Our sight is so integral for our intelligence that it is used in deepening our ability to perform many tasks from the mundane to the most intricate.

A particular sight driven endeavor that is of interest in our research is the ability of AI systems to use their computer vision and processing power to create new works of art. Image-making for the arts is considered to be an intelligence that is far less computational and is more intuitive than other human experiences.[19] Can this intuitive faculty be learned by a machine? If not, are we at a time where the human and machine are starting to come together to create new work by combining human intuition with the highly technically skilled AI systems? The latter seems to be true, rather than assuming the machine can and will take over this intuitive nature of a human's ability to create art. This contemplation of the union of human and machine opens up the question: Has this union of human and machine happened before? Our research shows that it has and is reminiscent of the discovery of photography in the nineteenth century and how it influenced image-making in many fields. We look at the beginning of photography to consider how it influenced art and artist at that time. We have found similarities in the adoption of photography to that of the adoption of AI image-making technology. Many of the early fears and criticisms of the invention of photography bare a striking resemblance to some of the fears of criticisms of AI image-making. By doing this comparison, we hope to give a small glimpse of how AI could give birth to new movements of art and create new ways for artists to interact with technology to create.

1.1 Consideration and Criticism around the Advent of Photography

Photography's emergence began in the early nineteenth century. A few processes sprang to life in Europe with Sir Henry Fox Talbot and Joseph Niepce, both claiming to be the first in its discovery. The earliest known example of an image being recorded by the photographic process was around 1822 when Niepce fixed his first image. This discovery led to the

[19] Walter Benjamin, The Work of Art in the Age of Mechanical Reproduction, 1st ed. (Harlow, England: Penguin, 2008).

continued development of an image capturing device that we now call a camera. Through the development of a sophisticated optical systems this mechanism could record the outside world more accurately than the most skilled artist could render through drawing, engraving, or painting. M. Claudet wrote in 1844 for the Royal Society for the Encouragement of Arts stating: "It has been remarked that the discovery of photography was as great a step in the fine arts as that of the steam-engine in the mechanical arts. There is no exaggeration in this observation; and certainly our age, will be celebrated for this extraordinary invention."[20] He realized that at this time the impact of this new technology would have an influence on the arts and sciences.

There were those that looked at this innovation with skepticism particularly in the arts like Charles Baudelaire.[21] Tatiana Kontou, Victoria Mills, and Kate Nichols wrote in an article in *The Crayon* that photography does not have artistic merit and that it will only have an impact of merely recording. Finding its merit in communications and that of cataloging in the sciences, they said photography "is limited to the mere reduction and copying of works previously engrave or drawn; for, however ingenious the processes or surprising the results of photography, it must be remembered that this art only aspires to copy, it cannot invent."[22] However valid this opinion may be, it does lack the foresight of the influence a human can have on such a machine. They did point out that it appeared that photography had a noticeable impact on drawing and engraving and they used painting as a cornerstone to challenge photography's ongoing claim as a new artistic medium. "The camera, it is true, is a most accurate copyist, but it is no substitute for original thought or invention. Nor can it supply that refined feeling and sentiment which animate the productions of a man of genius, and so long as invention and feeling constitute essential qualities in a work of Art, Photography can never assume a higher rank than engraving."[23] When looking at the early images of photography one can draw an easy visual comparison to the monotoned images

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[20] M. Claudet, "The Progress and Present State of the Daguerreotype Art," Transactions of the Society, Instituted at London, for the Encouragement of Arts, Manufactures, and Commerce 55, no. 8 (1844): pp. 89-110.

[21] Charles Baudelaire, "On Photography, from The Salon of 1859," Sacramento State University (Révue Française, Paris, July 20, 1859), https://www.csus.edu/indiv/o/obriene/art109/readings/11%20baudelaire%20photography.htm.

[22] Tatiana Kontou, Victoria Mills, and Kate Nichols, *The Crayon* 1, no. 11 (March 14, 1855): p. 170, https://www.jstor.org/stable/25526906.

[23] *ibid.*

that are created from graphite drawings and engravings. As with many inventions of this kind, their adoption tends to be more widely accepted in more practical applications initially. As the technology evolved and became more accessible, we start to see the technology used in more inventive ways—one of those being that of the arts. Having the benefit of being able to look back at the history of the adoption of photography into the many realms of human interest, we can see this to be true.

It was no secret that critics like Baudelaire and those writing at *The Crayon* thought that photography was an unwelcome new addition to the business of image-making and mocked the idea that the images produced by a camera would be considered artistic in any way. As these critics lament, they felt the skill of a painter came from their ability to accurately portray a given subject and, since the camera was doing most of the rendering it could not be seriously considered as a true artistic medium of expression: "The art of photography has, by its marvelous productions, led many to think that the perfection of Art must be in giving all details."[24] However, D.C. Thomas wrote an interesting remark about photography, as he contemplated the role of Realism in painting. He defended photography and looked at it as a helpful assistant in the field of painting in particular. "It is said that photography is hated by artists, but if so, it can only be by those who are unworthy of their calling: an inferior mechanical artist nay be jealous of such a rival, since it must compel him to be more faithful in his representations; but the artist with à true genius for his calling welcomes photography as a friend and ally; he will find scope enough beyond the limits of mechanical reproduction for the full play of his genius."[25] The play of an artistic genius lies in the intuition that is an inherent quality of our human nature. The ability of an artist to make decisions on what to include or exclude to invoke a feeling from a viewer is the piece needed to satisfy the qualification of artist and genius. Any tool that allowed these genius' the ability to express this intuition was welcomed.

This intuition and instinct accessed by painters can also be utilized by the selective eye of a photographer as noted *The Illustrated Magazine of Art* by Alexander Mongomery. In an article titled "Photography as Fine Art," they examine an "interesting collections of

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[24] D. C. Thomson, "Realism in Painting," *The Art Journal* 6 (1880): pp. 282-284, https://www.jstor.org/stable/20569577.

[25] Thomson, "Realism in Painting," *The Art Journal,* (1880): 282–84..

photographs now exhibiting both in this country and in England. Here we have collected into a focus the choicest productions of this wonderful art, contributed by practitioners of various countries, and fully representing the great state of perfection at which photography has arrived."[26] In their examination they found themselves quite taken by their quality and relevant subject matter. Upon their examination they determine that "There are, doubtless, [quality images] of equal merit, but in them we recognize all the conditions we require to be fulfilled in admitting photographic pictures to the rank of works of art; for, be it observed, that there are two classes, of photographers, the mechanical and the artistic: and the same object taken by two individuals will be insipid or interesting according to the amount of artistic feeling employed in taking the view."[27]

1.2 Criticism and Concern around AI Artwork Compared to Photography

Criticism over new innovations in image-making tools is not new as demonstrated by the criticism and concerns around photography in the nineteenth century. As digital photography became more utilized—"digital editing tools and computer-assisted design programs were similarly dismissed by purists for requiring too little skill of their human collaborators."[28] The differentiating factor between the new digital tool powered by AI is that some digital artists considered that the production of new work was made with little effort and sourced from work that is already in the public sphere. It is this process of sourcing previously made images from online sources that makes this new tool controversial. Text-to-image AI "apps like Midjourney and DALL-E 2 are built by scraping millions of images from the open web, then teaching algorithms to recognize patterns and relationships in those images and generate new ones in the same style."[29] This is very similar to what critics were commenting on in the nineteenth century. Beyond the ethical concerns around copyright in regards to the sourcing of images, the tools ability to imitate presents an argument that it is not making anything new and relies only on what had been created before. These large databases of images are a consortium of styles and subject matter ranging from painting to photography. Anything that has been placed on the internet or turned into a digital representation is feeding AI with

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[26] Alexander Mongomery, "Photography and Fine Art," *Illustrated Magazine of Art* 3, no. 13 (1854): p. 1, https://www.jstor.org/stable/20538189.

[27] *ibid.*

[28] Roose, "Won an Art Prize."

[29] *ibid.*

reference material. Which mean that it cannot make anything original and merely copying what other artists have spent many hours developing and creating.[30]

R.J. Palmer, a digital artist commented in *The New York Times*, "What makes this AI different is that it's explicitly trained on current working artists." He goes on to say, "this thing wants our jobs, it's actively anti-artist."[31] As digital artists contemplate their losses in commissioned work in the wake of such a technology, artists in the nineteenth century also considered their losses when photography made its appearance. One of the commission projects for artists that was affected was portrait painting. Wealthy patrons would seek out painters to render their portrait. The portrait was a symbol of a family legacy and was considered a status symbol. Photography allowed the personal portrait to be readily available outside the skilled artist's hand which threatened one of the ways artists made money at that time. One photographer could capture hundreds of portraits of willing patrons in a single day at an accuracy that far out-performed even the most skilled realist sketch artist or painter. Digital artists today see AI as a similar threat. Today AI can create unique images with imaginative compositions within minutes. Not only is it quick in its rendering results, it can also emulate any image style and can be guided to create any subject the user desires. Digital artists that create commissioned work of all sorts are looking at this new revelation with hesitation. What does it mean for commissioned work for digital artist in the future? Artists are comparing their time and effort spent on creating new work and wondering what it means to be creatively competitive in the marketplace as they compete with AI. Jason M. Allen, an AI artist, said "I do not believe, as some do, that these tools will destroy art altogether, though I think they will be disruptive and may very well cause pain for some of the people whose work was used to feed the models."[32]

Sam Altman is one of the leading men in AI application development. As one of the founders of the company OpenAI, he is deep into the effort of developing an AI system for most digital creative endeavors. He announced in August of 2022 "alongside Elon Musk— 'AI creative tools are going to be the biggest impact on creative work flows since the computer itself. We are all going to get amazing visual art, music, games, etc.'" This comments is reminiscent of

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[30] Roose, "Won an Art Prize."

[31] *ibid.*

[32] Matteo Wong, "Is Ai Art a 'Toy' or a 'Weapon'?," The Atlantic (Atlantic Media Company, September 24, 2022), https://www.theatlantic.com/technology/archive/2022/09/dall-e-ai-art-image-generators/671550/?utm_source=apple_news.

those made by William Talbot when he was contemplating the many uses that photography would eventually have. Talbot states, “though we may not be able to conjecture with any certainty what rank they may hereafter attain to as pictorial productions, they will surely find their own sphere of utility, both for completeness of detail and correctness of perspective.”[33] When scientists and engineers develop new technologies it is often done with grand visions of the future in mind. In both cases you see the big vision in mind as they tell of the many ways their new gizmo or invention can change the world. It is often this passion that drives the innovation into fruition, but it is then up to society to deal with the implications and impact.

An important innovation in the AI art spaces is the development of text-to-image AI. These systems are capable of developing almost any subject matter in almost any style of art just by using simple text. This kind of application is not new, but in recent years has made a huge improvement in the quality of images it can produce. Andy Baio an AI artist who uses this system states, “I know that [text-to-image AI] isn’t sentient and what it does isn’t magic. But big leaps in technology often feel a bit like magic. And because [text-to-image AI] spits out colorful, detailed, high-resolution images, it’s an especially evocative use case of Artificial Intelligence, and its effects feel very profound.”[34] The detail of the images produced by this method has improved considerably. The subject matter can be extremely inventive and one is only limited by language. For instance, prompts like “dog-bird" or “slugs in wedding attire getting married” are all possible with this kind of tool. “There’s a certain type of creative person who, when given access to the tool, tries to push the limits of the technology. Their goal is to try to confuse [text-to-image AI] with ridiculous, fantastical prompts or to find the places where the machine cannot match the associations a human brain is capable of,”[35] said Charlie Warzel. It has blossomed to the point that the work created has found its way into art competitions which ignited a fire-storm of controversy. Jason M. Allen entered his work from a text-to-image AI program called Midjouney into an art competition in the category of

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[33] William H Talbot, “The Pencil of Nature,” NYPL Digital Collections (The Miriam and Ira D. Wallach Division of Art, Prints and Photographs: Photography Collection, The New York Public Library., 2020), https://digitalcollections.nypl.org/items/cff7da80-343b-0136-4130-09d7963bd8b1.

[34] Charlie Warzel, “Tech's New Frontier Raises a ‘Buffet of Unwanted Questions,’” The Atlantic (Atlantic Media Company, July 26, 2022), https://newsletters.theatlantic.com/galaxy-brain/62df88dabcbd490021adc375/dalle-open-ai-midjourney-art/.

[35] *ibid.*

digital art at Colorado State Fair (USA). His work, "'Théâtre D'opéra Spatial,' took home the blue ribbon in the fair's contest for emerging digital artists—making it one of the first A.I.-generated pieces to win such a prize."[36]

As with photography, some artists are using this tool as a spring board for creativity. Painters have used photography to assist in their image-making. For painters in the nineteenth century, photography offered a unique way of capturing a person or place at the exact moment they desired to paint. Giving them insight into lighting conditions and providing detailed perspectives on a scene. In a similar way, tools that do text-to-image can offer starting point for many artists who create digital images. Some artists speculate that this could spark a new era of creativity.[37] They see it as a possible starting point that can be imported into editing software where they can add their own unique touch. "One could imagine game-design companies using [text-to-image AI] to generate weird in-game imagery at scale and plugging it into virtual worlds."[38] Many see this as spring board into the fantastic and not as an endpoint and more of the beginning of something new.

Photography and AI Image-making share many similarities when it comes to the trepidation of their arrival. Gregory Eddi Jones a contemporary photographer and AI image experimenter is more open to AI's arrival. He said "To be a photographer is to embrace technology and innovation."[39] According to him, embracing new technology is in the DNA of every photographer. As with any technological change in our society, it will change the way we do certain task. We agree with the AI artist, Jason Allen, as he feels that the emergence of AI will not eliminate photography, but it will change what photographers are asked to do in the future.

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[36] Roose, "Won an Art Prize."
[37] Warzel, "New Frontier.'
[38] *ibid.*
[39] Gregory Eddi Jones, Interview with Author, October 13, 2022.

Chapter 2: The AI Avant Garde

We saw how, before with photography, technology effectively moved the boundary of artistic expression. In 2022, we see our society grappling with yet another shift in the way images are created. AI's presence in our lives and the algorithms that underlie them are influencing our society. Examining the new generation of artists is crucial to understanding how AI is influencing art making today. Furthermore, looking at their experimentation and interest is also important for gaining an accurate glance into how AI will influence art and the professions of image-making. In the previous chapter, we saw Sam Altman exclaim that "AI creative tools are going to be the biggest impact on creative work flows since the computer itself."[40] How does Altman come to this conclusion and who are the artists working in these AI programs that are going to usher in this radical change and substantiate his clams? Altman goes on to say, "We are all going to get amazing visual art, music, games, etc."[41] In this chapter, we take a look at three case studies that examine artists who are using AI image-making software as a new medium and observe their efforts to reinvent the creative work flows. What do these creative work flows look like and what are the systems they are working in to make work?

The first example this thesis examines is the Obvious Art Group. This group unwittingly brought AI into the discourse of art and image-making in 2018. Their case highlights the collaboration between artists and online open source AI software engineers—as their interaction brought many valuable issues to the forefront. The next case study is Rashed Haq, an artist, scientist, and technologist who is interested in moving the discourse of image-making to be more inclusive of new technologies. His solo approach to image-making is a case worth examining because it gives insight into artists with the skillsets of software engineering and their interest to push the limits of what image-making can be. The final case study is of Boris Eldagsen, who is a photographer and film maker with a fine art background, adapting his knowledge and skills in art to the new paradigm of AI image-making. His experimentation and the way in which he challenges the boundaries of the systems gives a glimpse into how artists will be using these AI tools to make new work. By examining these

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[40] Roose, "Won an Art Prize."
[41] *ibid.*

artists and their practice we can get a view on how artists are using AI in the current environment and the problematic issues that may arise as many more artists start to work with AI and include it in their practice.

2.1 Uncovering the "Obvious" AI Issues - Obvious Art Group

From the initial production using open source AI models to their blockbuster sale in 2018, this case highlight artistic production methods, marketing/sales, and ownership claims that need consideration as AI's proliferation in many areas in our society becomes more common-place. Late in October of 2018, an AI piece from a series called "The Belamy's" went under the gavel at Christie's auction house. This piece was an AI portrait of one of the fictitious members of the Belamy family titled *Portrait of Edmond Belamy.* Framed in a traditional gold frame and depicting a gentleman in a classical pose with smudged features it resembled an eighteenth-century paintings. This AI art piece was expected to fetch a modest $7,000 to $10,000. It was a unique piece because the artist claimed that it was created by Artificial Intelligence and was the first of its kind to go on auction at Christie's. What happened next shocked everyone in the AI art community: the piece sold for an astounding $423,000 (350,000€).[42] The work was brought to auction by an AI art collective named Obvious Art Group which consist of three twenty-five-year old students from Paris, France. With this sale they became the new face for AI art—much to the dismay of the artists and engineers of the open source community from which they had pulled their AI code.

One of the necessary angles of this case that makes is necessary to consider is their adoption and utilization of borrowed computer code from the online open source community.[43] This brings many concerning questions to the surface, for instance, if they did not develop the AI program themselves, then who did? Who can claim authorship to this piece and furthermore its proceeds? Understanding the AI program that was used is helpful to understand with whom ownership lies. *The Belamy Family* was created by an AI program that uses a coding technique called a Generative Adversarial Network (GAN).[44] This is not a new method for

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[42] James Vincent, "How Three French Students Used Borrowed Code to Put the First AI Portrait in Christie's," *The Verge*, October 23, 2018, https://www.theverge.com/2018/10/23/18013190/ai-art-portrait-auction-christies-belamy-obvious-robbie-barrat-gans.

[43] *ibid.*

[44] Vincent, "Three French Students."

coders and artist to employ. The open source community has been sharing GAN models online in an effort to improve their overall usability and performance.[45] Knowing the origins of the GAN model the Obvious Art Group named their fictitious family after the original developer, Ian Goodfellow. The name “Belamy” is a pun for the French phrase “bel ami” which means good friend.

The GAN model has many limitations and the code needs to be finessed to get a result that is recognizable or readable to the viewer. GAN programming models tend to create similar results giving it a distinct look which has been coined “GAN Art” in the AI art community.[46] The way a GAN’s creative strategy works is by making predictions and assumptions based purely on mathematical calculations, yet it rarely knows the difference of key characteristics of the subject they are trying to create.[47] Their goal is to create an image that fulfills the initial request of the programmer (ex. portrait of a man) that will pass through the discriminator algorithm (the program that verifies the end result for accuracy). For example, let us consider a hypothetical job for a GAN program to complete: the portrait of a human. There are certain features that make up a human face that would need to be considered in order to accurately depict a human. When an artist draws a face, they know what a nose is and where it should be situated. A GAN model does not know what a nose is and that it should always be in the middle of the face unless it has been trained with a robust amount of data.[48] What can happen with GAN art is that it will confuse some features causing unrecognizable results like smudged eyes, distorted noses or warped mouths.[49] The level of distortion depends on how well the GAN was trained to discriminate the difference between these features. GAN artists like Obvious are using the same base code for their GAN model and tend to achieve similar results as those from whom they borrowed the code. These consistent results give this kind of AI art a distinguishable aesthetic that is recognizable to those in the AI art community.

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[45] Adrian Bridgewater, “CNCF Director Sharma: Community Is The Lifeblood Of Open Source,” *Forbes.com*, October 26, 2022, https://www.forbes.com/sites/adrianbridgwater/2022/10/26/cncf-director-sharma-community-is-the-lifeblood-of-open-source/?sh=2dbb75a85d20.

[46] Vincent, “How Three French Students Used Borrowed Code” *The Verge*, October 23, 2018

[47] *ibid.*

[48] *ibid.*

[49] *ibid.*

The GAN program that Obvious used was borrowed from a nineteen year-old programmer and artist named Robbie Barrat.[50] He is well known in the open source community for his GAN art of Surrealist imagery including nudes and landscapes. As a regular contributor to the open source community, he makes his GAN models available for others to experiment with for free which is in line with the ideas behind the open source community.[51] These internet communities are a decentralized collective of coders and enthusiasts who aim to democratize the utilization and development of AI programs. No one makes a copyright claim to authorship and individuals work together in public threads to develop these programs in an open and transparent way. Online communities like GitHub.com are at the center of these coding communities. Coders download existing code for experimenting and testing. They then make improvements and upload the improved code for others to test and provide feedback or guidance on further improvements. The back and forth of sharing and improving code is where the work and development of AI programs like GAN models is happening.[52] This is how Obvious found their code to help them generate their portraits.[53] The problematic area here is when Obvious put this work up for auction. They were cryptic in the way they presented this work to the public. They mentioned neither the origins of the code used to make this work, nor Barrat's contributions to the project.[54] The open source community does not claim any ownership of the code and Barrat does not make a claim on the project, but his efforts to help Obvious create the end the results are documented in the threads of the community.[55] His assistance was necessary for the final result because they needed him to debug the code they borrowed from him. The spirit of the open source community is that anyone can download any project on the site for free and make improvements as needed to retrofit the project code to fit the needs of someone else. Where it becomes problematic for those in the community is when someone asks the original coder to collaborate on a project without associating any credit. In Obvious' case, Barrat was solicited to debug and work on the model with them without having been given credit for his major contributions to their work. This is a grey area for the open source community.[56] It is in the spirit of the community

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[50] Vincent, "Three French Students."
[51] Bridgewater, "The Lifeblood."
[52] *ibid.*
[53] Vincent, "Three French Students."
[54] *ibid.*
[55] *ibid.*
[56] *ibid.*

to helping assist in any way possible, but it is also in good form to give credit where credit is due. In the case of Obvious, they did not. When they were pressed about the issue, they deflected to the fact that AI created the work when anyone who knows how these GAN models work knows the contrary.[57] The Obvious Art group does admit to the use of Barrat's open source code for their work,[58] yet they say they did do some work to slightly adjust the code in order to create the image they sold at Christie's. "If you're just talking about the code, then there is not a big percentage that has been modified,"[59] says Caselles-Dupré. "But if you talk about working on the computer, making it work, there is a lot of effort there."[60]

Finding open sourced code and the collaborative grey area is not the only part that makes this ownership claim hard to nail down. To use a GAN program, the first step is to collect training data for the model. Image databases are available for download for a price or the developer can use a program called a "scraper." The scrapers job is to collect properly labeled and categorized images for the model to learn from. Scrapers are common tools used in data collection and are designed to collect media files like images, videos, and music.[61] A simple Google search shows many companies that will search the internet in order to create a dataset for utilization in analytics or for AI applications. These datasets are crucial for the development of a GAN program. After the scraper has collected the data for the program, the next step is to develop the generative algorithm. This program works with the discriminator program to create new images. It generates a new image and the discriminator says whether it worked or not. It keeps doing this until the desired result is achieved. The dataset is used as a way of training the generative algorithm. The discriminator will use whatever data is present to determine whether the image produced by the generator has been successful.

The possible issues here are around the image datasets. Where do these images come from? Are they copyrighted images? Are scrapers looking past copyrighted images or does it care? It turns out that many of the images are being pulled directly from public websites or sites

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[57] *Vincent, "Three French Students."*
[58] *ibid.*
[59] *ibid.*
[60] *ibid.*
[61] *ibid.*

like Flickr.[62] "A lot of people believe that because data is public, it's fine to scrape,"[63] says Shane Evans CEO of Zyte (a provider of open source and proprietary Web scraping offerings.) "But it's still subject to [General Data Protection Regulation]. That means it may not necessarily be okay. You have to have a lawful basis for scraping it."[64] Europe's privacy law, General Data Protection Regulation (GDPR), requires data collectors to ask for permission to share data and also grants individuals rights to access, delete, or control the use of their data. The United States does not have any laws that cover the privacy of all types of data.[65] For those software engineers who want to get into AI programing, the scraper is a major component because this gives their AI program the necessary training set to work properly. If they do not have data then they do not have an AI program that functions accurately. This type of data mining is extremely useful for AI training, but how can we know what these programs have scraped from the internet? There are laws in place to protect your copyrighted images on the internet but do they apply to data training sets? More specifically, do images on Facebook and Instagram get looped into the mix? It is hard to tell and it also seems hard to enforce because the images that are created from AI are not direct reproductions of the work—they are just used as training material for program. Evans adds, "Many years ago, people would have worried a bit more about compliance, because it was just less clear how to interpret legislation that was never written with this in mind."[66]

Scraping the internet for resources is not the only issue surrounding image databases. The other issues are around the inherent bias that exists in categorizing and labeling of datasets which are based on social bias. While the social consequences of AI are popularly understood in the media[67] and are well-covered, the common understanding of technical limitations are not as well-known and is called the black box problem. "The black box effect is an actual issue of deep neural networks (which filter information so much that their chain of reasoning

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[62] Joler and Pasquinelli, "Nooscope."

[63] Alex Woodie, "Five Things to Know About Web Data Extraction Now," Datanami.com, October 10, 2022, https://www.datanami.com/2022/10/10/five-things-to-know-about-web-data-extraction-now/.

[64] *ibid.*

[65] Thorin Klosowski, "The State of Consumer Data Privacy Laws in the US (And Why It Matters)," *New York Times*, September 6, 2021, https://www.nytimes.com/wirecutter/blog/state-of-privacy-laws-in-us/ Sept 6, 2021.

[66] Woodie, "Web Data Extraction."

[67] Janice Rose, "This Tool Lets Anyone See the Bias in AI Image Generators," *VICE*, November 3, 2022, https://www.vice.com/en/article/bvm35w/this-tool-lets-anyone-see-the-bias-in-ai-image-generators.

cannot be reversed) but has become a generic pretext for the opinion that AI systems are not just inscrutable and opaque, but even 'alien' and out of control."[68] The issue here is the over simplification of data. When the over simplification is related to image classification, it results in simplistic representations of subject matter that cannot be reversed. No one category of image is simple in it its representation. For example, we ask an AI system to render an image of a CEO. The system will look to its generator trained for simplification, which will produce an image of a CEO that consist of a male that works in a high-rise. This is what it thinks a CEO is: a man in a suit. This bias cannot be undone because it has found a pattern within the images of CEOs and this is the most accurate statistical representation. Society has many CEOs that make up different genders, occupations, and races and having a simplistic approach to a subject like this can be problematic. "The problem of bias has mostly originated from the fact that machine learning algorithms are among the most efficient for information compression, which engenders issues of information resolution, diffraction and loss."[69] When looking at the images that were created with Barrat's code you can see this bias on display. The Obvious images in "The Belamy Family" are visually similar to those he is known to create. This is because they were using his pre-trained models to create their series. "Tom White, an academic [scholar] and AI artist from New Zealand, says the work is extremely similar, even downloading Barrat's code and running it with zero adjustments to compare the outputs."[70] Pre-trained AI models have distinct features to them and takes time to develop due to the black box effect.

One of the main issues that has created the most buzz around this project came from the way it was marketed. Obvious was finding it tough to market their work so they decided to change their tactics. They decided to take the position that the algorithm created it and wrote clever headlines to gain attention, like: "An Artificial Intelligence Managed to Create Art" and "Creativity isn't only for Humans."[71] This is a problem because it gives the impression that AI systems are autonomous and more creative than they really are. "It's the kind of thing you might say when you're anonymous or you don't think anyone's listening,"[72] says Jason

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[68] Joler and Pasquinelli, "Nooscope."
[69] *ibid.*
[70] Vincent, "How Three French Students Used Borrowed Code" *The Verge*, October 23, 2018
[71] *ibid.*
[72] *Vincent, "Three French Students."*

Bailey a digital art writer and blogger who created Artnome.com. These systems do not intelligently know what is in an image all they can do is statistically analyze the contents of an image and then create based on this information. They are not making cognitive decisions based on recognition like humans.[73] "Anyone who has worked with AI and art realizes [this]," says Barrat.[74] Cultural narratives focus on out-of-control AI and machines replacing humans often ignore these details. Their goal was to play into this and it worked. Caselles-Dupré reflected on this kind of marketing by saying, "When we sent those, we were on our couch thinking 'Hey, how can we get to these guys?' because we sent messages and got no answers and we wanted to have a discussion… We tried many stupid things and we totally admit it." The marketing of this work was clever and did create quite a buzz but it is simply not accurate to the reality of what AI is. If it were true, many of the artist working on this would have made the claims much earlier and may have benefited financially—like Obvious did with their sale at the auction.

The Obvious Art Group case points to the many dynamics that exist within the AI image-making paradigm. Questions around authorship and ownership surround this case as we examined closely the database curation and open source code used. Other questions still exist from this example that point to the ethics of their misleading marketing strategy that created the buzz and brought this kind of creation into more minds across the globe. AI Artists like Mario Klingemann are not keen to the idea that this work from Obvious should take center stage as the face for AI image-making software.[75] Other artists should be considered to gain a more accurate view of AI art making.

2.2 The Techno-Anthropologist - Rashed Haq

There are many people that find their way into creating art with AI systems. Rashed Haq is a Bangladeshi-American artist who has experience with AI and robotics engineering. He is in the early group of innovators and early adopters that helps push the technology forward in meaningful ways. He is the kind of creator that harnesses new technologies and reimagines the current landscape of creation for what it could be. In the example of Obvious Art Group,

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[73] Joler and Pasquinelli, "Nooscope."
[74] Vincent, "Three French Students."
[75] *ibid.*

we had a collaboration between three twenty-five-year old artists and an open source coder named Robbie Barrat. Rashed Haq is an individual, who is similar to Barrat—in that they are experimenting with the algorithms and developing work—but unlike Barrat and the ObviousArt Group case, he owns the process from start to finish. In the AI art field today (2022), many of these artists are at the helm of developing AI and showing work that challenges our perception of what art can be. In an article on Wired.com called "Are You Sure You Know What a Photograph Is?," Haq wrote about his explorations into the many ways a photograph will change with new technologies including AI image makers. We use Rashed Haq as a case study to show artists who are working on the cutting edge of image-making. Many of these artists are rethinking the way images could be used and to allow us a framework to understand how AI image-makers made their way into the current zeitgeist. Haq is a great example of one of those minds that is pushing technology in new ways of artistic expression and is ideal for consideration for this thesis.

Photography and the resulting photograph has been something he has contemplated for some time. He recalls a photo of his mother that was produced using an analog process: "These images were absorbed by my soul, stored as evidence of the stories of my family from before my birth, and are now on my kids' iPhones."[76] These photos and their associative qualities fascinated him and causes him to reflect on the inherent qualities of what a photograph was. He became interested in the process by which they are made. He recalls learning the technical analog process to produce an image then considered the world of image-making technology, and at that time in 2022, was struck with the question of what a photograph was. Haq now says, "twenty-five years later, sitting in my studio surrounded by thermal cameras, lidar, 3D printers, and AI software, I am not so sure anymore."[77] Technology is affecting every process in image-making. New image capturing technologies are being created for many applications in the sciences for computer vision and the resulting images are prime for exploring innovative ways to express oneself. The printing processes, and notably 3D printing in his view, are also something that is challenging the idea of what a photograph.

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[76] Rashed Haq, "Are You Sure You Know What a Photograph Is?," *Wired*, January 28, 2022, https://www.wired.com/story/photography-artificial-intelligence-technology/.

[77] *ibid.*

For this thesis, his interest in AI serves as a case study to look at how groups of artists were making their way as the new "avant garde." Armed with software engineering skills and powerful computing power, these artists are developing and working with Artificial Intelligence to create new visual languages and creative processes. Working with creative algorithms and the same AI GAN models as the previous case study, Haq sought out to create his own work with AI. In an interview conducted for this thesis, Haq said: "So, a lot of my art is about cyborg anthropology, so how society is affected. Technology and technology adoption and vice versa. So, I generally think of the human condition as a technological condition because we we've always been using and evolving technology, which then in turn shapes us."[78] In his first experiment using AI GAN models, his goal was to create people that did not exist. Haq says, "Like a chef experimenting with different combinations of ingredients to see which version works, the AI develops a picture through experimental trials that extrapolate from different aspects of the existing images."[79] The part of this creation method that interested him was the computer's ability to pull together different elements of the human face to recreate something altogether new. This experiment resulted in a series he named the "Human Trials" (fig. 1.1). He says, "the AI-generated photos expand our vision to possibilities and imagination because it is 'photographing' things that do not exist in our physical world."[80]

Haq then started to work with AI and image recognition technology, where he would ask an AI text generation model to generate text based on images he would capture in camera. He felt this experiment was interesting and the results composed a series he called "Altered Eigenstates" (fig. 1.2). Inspired by bad data and the idea that we live in an algorithmic world, he sought out to use these to make portraits. His strategy included a technique called light painting. Using a dark studio and a single light, Haq would recreate the portrait. His technique included using a digital camera and the resulting image is a combination of poses and perspectives that are all captured in the same image. He would then feed these images into an AI system called Generative Pre-Trained Transformer (GPT-3) to create text for the image. "GPT-3 can create anything that has a language structure. It can answer questions,

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[78] Rashed Haq, Interview with the Author, October, 26, 2022.
[79] Haq, "Are You Sure?"
[80] *ibid.*

write essays, develop summaries of longer text items and it can even translate languages. As an example, *The Guardian* published an article that was composed entirely by GPT-3."[81] The resulting text is poetic in nature and as he says, the titles read like a poem.

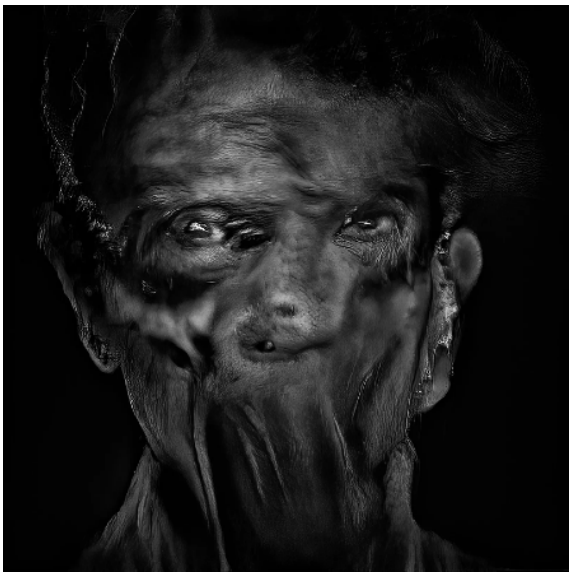

Figure 1.1, Haq, Rashed, *HUMAN TRIALS,* Artificial Intelligence GAN*,* 2015*,* Houston, https://www.rashedhaq.com/art/human-trials.

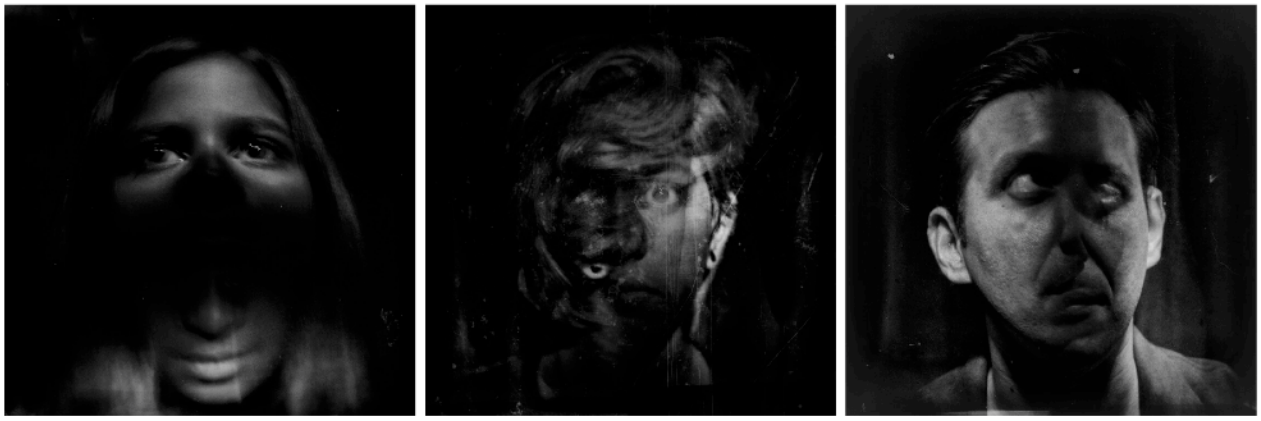

Figure 1.2, Haq, Rashed, *Altered Eigenstates,* Digital Image processed with GPT-3 for captions (3 image sample), 2016, Houston, https://www.rashedhaq.com/art/altered-eigenstates.

One of the most popular AI image-making systems today are the systems where users pay to play. These are AI image-making softwares, like Midjourney and DALL-E, that allow artists to use their pre-trained AI models to create using text prompts. As these gain in popularity,

[81] Jerry Weissman, "Presentation Lessons From Axios And GPT-3," *Forbes*, October 19, 2022, https://www.forbes.com/sites/jerryweissman/2022/10/19/presentation-lessons-from-axios-and-gpt-3/?sh=2b53a68a17a1.

Haq's views on these systems and their uses as artistic mediums give us a clue into how they could be used as an expressive medium. When asked if these programs should be considered an artistic medium, Haq said, "Somewhere in between. And I haven't really generated any or created any art with those yet because what it feels like is I don't have much artistic control. You get the algorithm that you get, so you can't manipulate the algorithm. You can modify the loss function, you cannot retrain it, you know, for your own images or dataset, etc.—"[82] He liked the control he had when he was working with the code directly, which allowed him the ability to train and retrain the model. He did however comment that even though an artist does not have the control of the code, an artist does have control of the language they use to create the prompts for AI to interpret. In this way, he does feel that an individual can create a unique signature in their creative process using these programs. He used a camera as a metaphor: "So, you know, there is still some artistic value in that when if somebody can work through it. So, to me it's more like a camera… And so, if you're pointing and clicking at some space and then with AI you are doing it in some virtual space where the words have converted into images."[83] He feels that artists using these ready-made AI image makers will have a tougher time differentiating themselves from each other because the systems have similar outcomes (Black Box Effect) and someone could use the same prompts to recreate work with ease. Yet, he continues with the photography analogy by saying "there are billions of people who take photographs, but they're not artists. Billions of people will or can use Midjourney and they're not going to be creating art in a sense, but they will, like with cameras, create images that they can keep and enjoy."[84] He points to this analogy to unpack the idea that it is possible to use these AI systems in an artistic ways and it is possible for an artist to create their own artistic voice.

The way this new avant garde is thinking about photography is important to consider. Understanding those that push the boundaries of what can be created using new technologies helps us understand where we are going in the near future with technology. Haq aims to rethink the photograph as he searches for theory to support his evolving idea of a photograph. He finds that popular image theory and criticism needs to expand, explaining: "Theory and

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[82] Haq, Interview.
[83] *ibid.*
[84] *ibid.*

criticism need to move beyond today's coordinates of the discourse."[85] He points to the many ways to capture image data as well as the new ways we can process that data to make and view new work. He believes the discourse should be more inclusive of newer ways of making images, in speaking about the twenty-first century and the many inventions that add to the growing diverse discourse around photography. Powered by software and new sensors capable of seeing outside our visual spectrum will help us see the world in new and profound ways. "Pushing these boundaries will enable us to see the world more clearly, see more things we could not see before, and be able to see and print our thoughts."[86]

2.3 Pushing the Edges of AI - Boris Eldagsen

Boris Eldagsen is an artist who is an adopter of AI image generation software and has produced a few notable series using this tool. His methodology and thought process around this new medium demonstrates a turning point in how artist will be conducting digital image creation with AI. He represents the next wave of adopters of AI that will be translating their artistic skillsets to new technologies. Eldagsen is more aligned with the main stream adopter similar to the Obvious Art Group in the previous case study. What do we mean by a main stream adopter? In the Obvious case study, they had a small role in the development of the AI GAN models that helped craft their series (Barrat and the Open Source community had more of a hand in its development). Obvious was more instrumental in putting together an artistic concept, packaging, and putting it before the public. In this way, we feel that Eldagen fits the mold of one of those adopters who are more main-stream: they are less interested in the algorithmic code development and more interested in using the algorithm to give a voice to their subject. By looking at different artists and their various entry points to this technology, we can get a better feel for how it will effect image-making in the future. Eldagsen's work is emblematic of how photographers will be adapting their skills with AI becoming more adept in its image-making capabilities. This case study is relevant in this thesis because he is already an established photographer and film maker and is adapting these skills into experimenting and making compelling work with AI— and this without being a coder or software engineer.

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[85] Haq, "Are You Sure?"
[86] *ibid.*

Eldagsen is a photographer and multimedia artist whose subject matter is inspired by the unconscious mind and its hidden desires. Using archetypes and symbolism to express the unconscious in his work, he aims to achieve dream-like experiences focusing on the unseen mechanism of our human existence. His goal is to transport the viewer into the sublime and the uncanny. In an interview conducted for the purpose of this thesis, we explored the motivation and methodology behind his interest in AI image-making beginning with his early interest in AI image generators. In one of his first experiments to explore its capabilities, he desired to recreate images of twins like the photograph by Roger Ballen (fig. 1.3), about which he stated, "Yeah. I did two brothers that look a bit like Frankenstein Monster."[87] He goes on, "I got very interesting results from DALL-E 2 (AI text-to-image generator), that showed that the AI really understood the spirit of Roger's work."[88] (fig. 1.4) His results gave him many interesting variations of twins: different ages, different genders, different looks, yet all were uncanny like the original (fig. 1.5). The AI image generator was, in his mind, successful at getting away from a simple reinvention of the twins' image in black and white and in capturing the essence of the image.

An experiment was done in preparation for a talk he gave at the PHOTOPIA conference in Hamburg, Germany. This creative content conference discussed some of the more important image trends happening in the field of photography and video production. His talk discussed AI text-to-image generators and how they work. Many of the people who attend these conferences are working professionals as content creators. With this in mind, he was curious if he could create quality content in the same genres. He began by downloading images from the largest German association of professional photographers. He collected images from all of the genres like landscape and industrial architecture. He said this was an interesting twist in his experimentation with AI because he usually uses these AI tools from an artistic perspective.[89] In a process called image-to-image AI processing, the system will analyze an image provided by the user and then attempt to produce a unique variation of the image. This is different than making a copy because you are asking AI to make a unique version in the style of the reference. The AI system will then make a new iteration of the image that is

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[87] Boris Eldagsen. Interview with Author, October 7, 2022.
[88] *ibid.*
[89] *ibid.*

Figure 1.3, Ballen, Roger, *Dresie and Casie, Twins, Western Transvaal*, Gelatin Silver Print on Paper, London, Hamiltons Gallery, 1993.

Figure 1.4, Eldagsen, Boris, *Image-to-image Experiment - A portrait of twins photographed by Roger Ballen*, DALL-E2/ OpenAI, 2022, Unpublished.

Figure 1.5, Eldagsen, Boris, *Text-to-image Experiment - A portrait of twins photographed by Roger Ballen*, DALL-E2/ OpenAI, 2022, Unpublished.

similar in composition and subject matter. With this process in mind, he then took these images and uploaded them into the AI system in an effort to create a catalog of AI generated images that matches the varied genres of professional photography. After creating and analyzing the new images, he was impressed by the results and the way in which AI performed this task. He said, “The more conventional and business-like the images are, the easier it is just to make variations and to work with Artificial Intelligence.”[90]

Intrigued by his results in making stock photos, he advanced with the image-to-image method taking on the task of trying to recreate some iconic album covers by the well-known UK photographer, Brian Griffin. Griffin has produced many of the most famous album covers in the 1980s for musical artist like Depeche Mode, Billy Idol, and Peter Gabriel. The particular photo that interested him was a cover Griffin photographed for Depeche Mode of a man with a sledgehammer in front of the Matterhorn in the Swiss Mountains (fig. 1.4). This challenge for the AI system was more complex (fig. 1.8). Eldagsen said that this task “was quite difficult for DALL-E 2 (AI image generator) to get a good variation of. So, it shows me that the more unique an image is, the more difficult it is.”[91] It appeared to him that images which had a more unique composition and subject matter were an obstacle for the system to create accurate variations (fig. 1.7).

His previous experiments were more conventional in their approach in that they were trying to copy styles and recreate existing works of art. In the summer of 2022, he was selected to become a beta tester for DALL-E 2. At this point in time, he claimed that DALL-E 2 was the “best AI for image generation with prompts.”[92] With this beta test, his goal was to use AI in ways that pushed its limits. Some of the AI systems have guidelines and regulations for “Not Safe For Work” (NSFW) content. Some of the limitations include creating images of celebrities and pornography. When a user creates images that cross these guidelines, the user will get warnings to discontinue the NSFW content. Being an artist that likes to create images that challenge the viewer and speaks to our unconscious mind he was curious how far the system would let him go. He said, “I had about fifty warnings before my account was

[90] Eldagsen, Interview.
[91] *ibid.*
[92] *ibid.*

Figure 1.6, Griffin, Brian , *Construction Time Again*, Depeche Mode Cover Photo, 1983, https://www.briangriffin.co.uk/photography/album-covers/depeche-mode/construction-time-ag~23?scroll=left.

Figure 1.7, Eldagsen, Boris, *Image-to-image Experiment - Depeche Mode, Construction Time Again by Brian Griffin*, DALL-E2/ OpenAI, 2022, Unpublished.

Figure 1.8, Eldagsen, Boris, *Text-to-image Experiment - Depeche Mode, Construction Time Again by Brian Griffin*, DALL-E2/ OpenAI, 2022, Unpublished.

deleted."[93] This push and pull between the systems limitations and the humans desire to push the limits fascinated him. The title of his series "VOMIT" was inspired by this push-pull dynamic because the AI system created the images but denied to process them any further by spitting them out like vomit. He said, "the AI behaved like a human being to his own (Jungian) shadow. In C.G. Jung's analytical psychology, the shadow is an unconscious aspect of the personality that does not conform to the ideal of the ego, it is the repressed blind spot of the psyche that causes the ego to resist and project the shadow."[94] In this way we see an artist using the system to create highly conceptual work through the production process and through the final images that are ultimately produced.

His process with working with AI image generators also takes on a methodical approach. He said the process of developing text prompts to drive the image results was a welcomed challenge. "For me, this is the more exciting option, because you have to be able to imagine the image beforehand and then describe it in speech. If you use blocked words, you get a warning. Both workflows produce four versions each."[95] For him the first generated results is not where he stops. He feels these first images are just the beginning of something new. His process includes an editing process that focuses on language first. This editing process allows him to delete parts of the image that he is unhappy with and have it recalculated four new versions. He does this by modifying the prompt subtly to create a slightly different result. If the AI system produces something close to what he imagines, he then lets the AI improvise the edits, allowing it to recalculate to produce four more variations without adjusting the prompt. In the "VOMIT" series, he tried to have very long prompts. In the construction of these prompts, he deliberately tried to overload the interpretation engine in the AI system. The idea was to have the system work with uncertainty where the AI does not know what the subject is. He ended up creating scenes that do not make much sense from a conventional stand-point. He said, "We [AI and himself] are making a mix of different beings like animals and humans, animals giving birth to humans and humans giving birth to animals."[96] In this work, he was able to construct a series that had a cohesive aesthetic and subject, even though

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[93] Boris Eldagsen, "Vomit," Photo & Video Art Berlin, accessed October 7, 2022, https://www.eldagsen.com/vomit/.

[94] *ibid.*

[95] Eldagsen, "Vomit."

[96] Eldagsen, Interview.

he was challenging the system in this way. In the development of his AI series, he experimented with language by creating new words and phrases. He talks about the fun he had in creating a personal lexicon: “Yeah. To misspell terms on purpose, to create new words, to create wrong grammar and all of that, and then to get certain results.”[97]

As a fine art photographer, his work was aimed at creating surreal and provocative images that made visible the hidden desires of the subconscious mind. His work in film and photography was often produced in studio with models and studio lighting techniques. As someone who is trying to capture an unseen perspective through the camera, he spoke of feeling empowered in a new way with AI: “Now with Artificial Intelligence, I don't need that material obstacle anymore. I can get rid of it and that's something I enjoy. So, the working process has become easier for me, but for others that are doing more [traditional] photography, for them, I think it's different.”[98] He goes on to explain the added control he is able to utilize to create. “I love the in-painting, I love the out-painting option.”[99] The option of in-painting is an added level of input that is utilized to retouch an image that is created by an initial prompt attempt. It is often used to fill in areas of the image that the user feels needs more context. The AI system will use its deep learning algorithm to add new elements based on the original prompt. This can add new subjects or fill in the background adding detail. The out-painting option is the opposite. It is used to remove elements that are not desired in the composition and then backfill based on the intent of the original prompt. This can be useful when trying to simplify an images composition. Controls like this allow artists like Eldagsen to work more closely with the AI algorithm. He explains that this process of in-painting and out-painting “leads often to a process where it is twenty up to thirty loops of re-editing, using in-painting and out-painting with DALL-E 2. And then it becomes a process where you need to have a knowledge of art history.”[100] This added level of retouching calls on his training as an artist. He explains that understanding the medium that you are mimicking is crucial. Having knowledge of painting, drawing, and photography and the common techniques within

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[97] Eldagsen, Interview.
[98] *ibid.*
[99] *ibid.*
[100] *ibid.*

the field helps you fine tune the prompts as needed. He said, “You can actually be a director and yeah, make more choices than just say, generate four images and I choose one.”[101]

The case studies in this chapter examined an emerging new generation of artists to help clarify how AI is influencing art making today. Furthermore, looking at their experimentation and interest is important for gaining a clear view into how AI will influence art and the professions of image-making. The Obvious Art Group gave a look under the hood of how AI image generators work and the problems that exist around authorship. They also highlight the misleading way AI is being marketed to gain public interest. Rashed Haq gave us a look into the new skillsets that artists are developing to create work as he challenges the idea of what a photograph is. Finally, Boris Eldagsen provided an example of a fine art photographer who is adapting his skills to a new medium. His experimentation with trying to create some of his artistic influences are a clear way to see what AI programs are capable of creating.

[101] Eldagsen, Interview.

Chapter 3: The Shifting Image-making Landscape

"A narrative has begun to percolate through the world of venture capital that text-to-image AI is the next big thing."[102] AI image makers like text-to-image systems are bringing many questions to the surface concerning their viability in the creative industry. We see AI artwork making appearances in the fine art market but as the author of *Rise of the Robots* Martin Ford suggests: Is AI ready to take our creative jobs? In this chapter, we examine where AI text-to-image systems are in relation to Rogers' Adoption-Diffusion model. Considering that it may be ready for mass adoption, what new skills should be developed to interpret image-making skills to the new paradigm? Finally, in this chapter we look at the technology as a whole and analyze the viable uses for the AI tools that are available to image makers in 2022.

3.1 Is AI Ready For the Rogers Adoption-Diffusion Model

AI image makers have made large improvements in the quality of images and user accessibility overall. So as to consider the leaps forward of this technology and try to forecast what its influence will be in the creative fields, we can apply an economic adoption-diffusion model to analyze what stage of the process we are currently experiencing, in 2022. Everett Rogers' research, *The Diffusion and Innovations* published in 1962, is an ideal model to assist in the understanding of where to situate AI.[103] Rogers' work is important because many models of adoption and diffusion of technology have been influenced and supported by his work. In this thesis, we look at the adoption subprocess of diffusion which explains the technology's application in society as a whole. We will assume a larger scope as we look at AI's influence on the creative industry, and use as criteria the four primary elements of Rogers' diffusion theory: innovation, communication channels, social system, and time.[104]

The innovation that is significant to AI image makers is the text-to-image creative process. The AI algorithm's ability to interpret text into a readable and usable image is a big shift in image creation. "Rogers identified five attributes of an innovation that influence its adoption:

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[102] Rob Toews, "4 Predictions About The Wild New World Of Text-To-Image AI," *Forbes*, September 11, 2022, https://www.forbes.com/sites/robtoews/2022/09/11/4-hot-takes-about-the-wild-new-world-of-generative-ai/?sh=3877c6613d93.

[103] Straub, Evan T. "Understanding Technology Adoption: Theory and Future Directions for Informal Learning." *Review of Educational Research* 79, no. 2 (June 2009): 625–49. https://doi.org/10.3102/0034654308325896.

[104] *ibid.*

relative advantage, compatibility, complexity, trialability, and observability"[105] The "relative advantage" to AI image makers is the accessibility of nontechnically skilled individuals to utilize the program to create new unique work: "Even those who are not artistically inclined could use such tools to generate and share creative images."[106] "Optimistically, you might say this is revolutionary in communication," says Tom White, an artist based in New Zealand whose work explores Artificial Intelligence.[107] The advantage here is allowing users to create work that aligns with their ideas within seconds. The "compatibility" of the images that AI makes in to our existing image culture gives the new users a new expanded voice. When Obvious Art Group and Rashed Haq were working with AI GAN models the "complexity" of utilization was extremely high. Having base knowledge of computer code and AI models was the barrier for entry. The simplification of the models by the development of user-friendly interfaces has opened the door to new users of all skill levels with AI systems like DALL-E and Midjourney. The accessible interfaces eliminate the need for understanding code and training AI models. Boris Eldagsen is an example of an artist that is using these AI systems to make new artwork. Midjourney's go-to-market strategy in April of 2022 with a free trial period through programs like Discord have expanded this AI image makers "trialabilaity". OpenAI's DALL-E 2 also opened access to all users in October of 2022, giving new users different options to try these tools. One of the final aspects of the innovation phase is the "observability" of the technology to speed up implementation. Sites like lexica.art are databases of prompts that help user get up to speed on how to create prompts—which is the secret to AI image makers usability. The innovation phase of this technology is in full swing and seems primed to make a major leaping into the creative fields.

Considering the rest of the diffusion model, the next element is the communication model. This particular element is concerned with how the new technology is being communicated through the community or culture at large. Rogers' model states more specifically that "this can be direct communication, vicarious observations of peers and models, or even the influence of mass media. The level of access an individual has to innovation affects the

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[105] Straub, "Adoption Theory."

[106] Will Knight, "When AI Makes Art, Humans Supply the Creative Spark," *WIRED*, July 13, 2022, https://www.wired.com/story/when-ai-makes-art/.

[107] *ibid.*

diffusion process."[108] AI image-making entered the zeitgeist in a very public way with the well-publicized auction at Christie's of the piece by Obvious Art Group[109] and subsequent involvement of major investors like Elon Musk in companies like OpenAI.[110] We drew a comparison of this phase in Chapter one to a similar technological revolution as we examined photography's communication phase. Where AI does not seem to have reached in Rogers' model is in the later stages of the diffusion model, which is the integration into social systems in mass. Rogers defined it as "a set of inter-related units that are engaged in joint problem-solving to accomplish a common goal."[111] A clearer definition of social systems would be work environments, organizational groups, informal groups, and the subsystems of any of these groups.[112] At this point, the only place we have seen these integrated is in niche areas of early development in open source communities like GitHub.com. This kind of work is starting to make its way into the fine art market slowly. For example, we saw Obvious Art Group become the first purely AI artist to get gallery representation in November 2022.[113] This is a signifier of a changing viewpoint around work that is made with AI text-to-image systems. If they are the first, that may mean many more have the potential of gaining representation in the fine art markets. The final element of the diffusion model is "time." "To better understand this process, Rogers first categorized adopters into groups based on the relative amount of time it took for a percentage of individuals to adopt. This diffusion curve (generally conceptualized as an S shape or a normal curve) suggests that there is a small percentage of early adopters, a large group of mainstream adopters (early and late majority), and finally a small percentage of late adopters."[114] We have spent time in this thesis looking at early adopters of AI image makers and how they are using the technology. We propose that we are on the cusp seeing the mainstream adopters making their move. One of the main reasons why we have named this new generation of makers the new "avant garde" is because

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[108] Straub, "Adoption Theory."

[109] Cohn, "Sells for $432,000."

[110] Beatrice Nolan, "Artists Say AI Image Generators Are Copying Their Style to Make Thousands of New Images - and It's Completely out of Their Control," Business Insider (Business Insider, October 17, 2022), https://www.businessinsider.com/ai-image-generators-artists-copying-style-thousands-images-2022-10?r=US&IR=T.

[111] Straub, "Adoption Theory."

[112] *ibid.*

[113] Richard Whiddington, "The French Collective Obvious Has Become One of the First A.I. Artists to Receive Gallery Representation," Artnet News, November 1, 2022, https://news.artnet.com/market/french-collective-obvious-becomes-one-of-the-first-a-i-artists-to-receive-gallery-representation-2202005.

[114] Straub, "Adoption Theory."

this kind of accessibility will enable a new group of people to join the art world. This means we will be hearing from creatives with new perspectives and ideas that had not been a part of the community until now.

3.2 How Can Artists Adapt to a New Paradigm?

If text-to-image AI is moving to main stream adopter, what skills are needed to adapt to this creative process. The key to transitioning requires a different way of thinking about the skills needed to create new artwork. In this section, we analyze the skill of prompt-making and the use of precise language. AI's impact on creative activity will be influencing many fields from writing, music, and image-making. More specifically, with AI image makers, the new techniques will be firmly based in the knowledge of the arts. In relation to this thesis, we will only consider AI image makers like text-to-image and image-to-image AI systems. First, experience in computer vision and natural language processing (NLP) models is useful. Understanding how a computer sees and what language is most effective for AI to interpret clearly helps guide the AI. It is also required for users to develop a visual knowledge in art, design, photography, cinema and television. This creates a framework for developing ideas and visual references that can assist AI in knowing what styles to adopt. Finally, users should be investing in developing their use of descriptive language through studying art history.

AI image generators need clear prompts to be effective and the use of design language is one of the main skills needed. AI image makers do not need much in order to create. Initially to create an image all a user needs is a subject and AI algorithm will attempt to create it. Almost immediately a user starts to realize that specificity is key to using AI. Prompts that are the most effective have two elements that make them useful. Eric Griffith, from *PC Magazine* has a clear way of describing the necessary elements for developing prompts: "Design prompts have both content (what you want to see) and modifiers (how it should look). For example: 'A robot drawing a painting at an easel' is content, but 'over-the-shoulder view, colorful, oil paint, in the style of Van Gogh' are all modifiers."[115] This instruction points to the necessary knowledge that one must have in order to guide AI effectively.

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[115] Eric Griffith, "How to Use the Dall-E AI Art Generator to Create Stunning Images From Text," *PC Mag*, November 4, 2022, https://www.pcmag.com/how-to/how-to-use-dall-e-ai-art-generator.

The subject is the most obvious part of the equation and very important to creating with AI. The more specific the user is about the subject matter in the image, the easier it is for AI to align with the artist's true intentions for the image. "You usually type in some sort of a line to say, 'I'm looking for something like this,' and then it creates that, and then people get more and more detailed, because they're trying to push it"[116] explains Jason Scott, about the creative process to constructing prompts. One of the main elements he is pointing to is being descriptive. For example, it is easy to request that AI creates an image of a "cellphone on a table." What he is suggesting is to push the limits of the request. Instead of a "cellphone on a table," we should add more context to the request. For example, "cellphone with a kitten cellphone case on a table in front of the Taj Mahal right before sunset." A request like this gives AI more to work with and helps guide the AI algorithm in a specific way. Scott lists off some of his initial ideas for prompts that he enjoys; he says, "this is Santa Claus riding a motorcycle in the style of 1970s Kodachrome. This is Godzilla at the signing of the Declaration of Independence."[117] This kind of request and the capability of the AI system to process such a request in interesting ways, points to the capability of these systems to create anything an artist desires. Thus, the only barrier to these systems is the user's imagination.

The modifiers are more significant than the subject matter to creating an individual signature as an artist. Exercising some kind of control over these systems in a creative way moves it from novelty to artistic medium. "In order to create something new, you must first know what has come before. AI art is no different. To create truly original and impactful art with machine learning, you must have a strong foundation in the history of art,"[118] explains Eva Rtology, in her article about creating with AI. She points to a very important element to consider when creating with AI, which is some kind of artistic training or education, including having knowledge of design language and of art history. Eric Griffith adds: "You should take into consideration in your prompt, such as using terms like 'close-up' and possible camera angles, types of lighting, listing eras to mimic, such as '1920s,' or even mentioning a specific camera lens or smartphone type that 'shoot' the AI image."[119] This type of language is the key to

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[116] Wong, "Toy or Weapon."
[117] *ibid.*
[118] Eva Rtology, "Can I Use AI to Create Art?," Medium (MLearning.ai, August 19, 2022), https://medium.com/mlearning-ai/can-i-use-ai-to-create-art-1a93f91fe4fe.
[119] Griffith, "DALL-E AI Art."

unlocking the creative potential of the user. Subject matter is only one part of the creative process in text-to-image AI systems. Taking prompts to the next level requires pushing the system more specifically by adding complexity like design language. We can look at how to improve the previous example by adding a few more modifiers to give an example of this design language. The request was a “cellphone with a kitten cellphone case on a table in front of the Taj Mahal right before sunset.” In order to get a specific result, we need to add some modifiers like “wide angel shot” to get the perspective we want and then something like “rule of thirds” to get the correct composition. The most common modifiers are those that point to style and are often inspired by famous artist like Pablo Picasso and Salvador Dali. Although painters are not the only style modifiers: users can use different styles of photography films to guide the image. Descriptive skills, knowledge of art history and understanding of artistic technique are all necessary for an artist to push the boundaries of what these systems can do. These are the key ingredients for using AI image makers as a medium.

3.3 Will AI Replace Artist and Creatives?

AI tools and generators have worked their way into modern creative work flows. We saw how artists are using image generators and we have examined the knowledge and skills needed to work with AI image makers. The important question now is: Just how far can AI go to replace humans in creative jobs? Is AI capable of replacing humans today or in the near future? To answer these questions, we look at how effective AI image-makers and AI tools are for some of the creative jobs in the marketplace today. As of 2022, it does not look as if AI is at a level to replace humans entirely for creative output. Artists that are experimenting with AI image makers and AI tools describe them less as a replacement and more of an artistic assistant or a muse. “It's like talking to an alien entity,”[120] says David R Munson, a photographer, writer, and English teacher in Japan who has been using DALL-E for the past two weeks. “It is trying to understand a text prompt and communicate back to us what it sees, and it just kind of squirms in this amazing way and produces things that you really don't expect.”[121] So, if they are not a replacement yet, then in what ways can they be useful in the creative world? “That scenario largely hinges on artists finding inventive ways to make AI

[120] Knight, “AI Makes Art.”
[121] *ibid.*

work for them rather than against them. For example, an architect can use the tool to envision new possibilities of coexistence between buildings and nature; product designers might streamline the sketching process."[122] AI in this way is a creative starting point. Pointing existing designers and artist in new directions—the possible answer to the artistic block.

Practicing artists tend to rely on adapting their skills to serve private clients for different art needs. There are some financial opportunities that will feel the disruption more than others. Rob Toews of *Forbes* magazine suggests it has many practical applications saying, "even setting aside this high end of the [fine art] market, there are numerous more quotidian uses for art to which text-to-image AI could be profitably applied: book covers, magazine covers, postcards, posters, music album designs, wallpaper, digital media, and so on."[123] One of the main financial opportunities that will see AI image makers expand will be advertising. Companies like Kraft foods are starting to consider ways to include this kind of art in their advertising.[124] With text-to-image having the capability to create any image cheaply with low skill, it has the potential to takeover many roles in the advertising arena. This could affect the desire of some companies to seek out artists for creative work. One particular niche market that Toews views as being the most affected is stock photography. He says, "Take stock images as an example. Stock imagery may seem like a relatively niche market, but by itself it represents a multi-billion-dollar opportunity, with publicly traded competitors including Getty Images and Shutterstock. These businesses face existential disruption from generative AI."[125] This kind of market potential gives AI image makers a bright future outlook for more investment and expansion. With more investment and time, we have yet to see what AI can do to influence other creative endeavors.

The more practical and more prevalent way in which AI will be adopted is making creative workflows more efficient. As one AI company announced, "One part of OpenAI's release notes cautioned that 'the model may increase the efficiency of performing some tasks like photo editing or production of stock photography, which could displace jobs of designers,

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[122] Ryan Waddoups, "What Will Image Generators Mean for the Creative Industries?," *Surface Magazine*, August 18, 2022, https://www.surfacemag.com/articles/dall-e-ai-image-generators/.

[123] Toews, "4 Predictions"

[124] *ibid.*

[125] *ibid.*

photographers, models, editors, and artists.' "[126] Adobe, a creative software company, is currently investing in AI tools because they feel that there will always be need for a human's imagination and creativity. They have been developing an AI system called Adobe Sensei in which they use to identify time-consuming creative tasks to automate through the system. "For example, in Photoshop and Lightroom, it's made the Object Selection tool work even more accurately, with a wider array of objects." This is a tool that "allows you to hover over an object within a photograph and the software will automatically detect and select it. You can then tweak it to your liking or just delete it with a single click. Content-Aware Fill will step in and fill in the background, so no one would ever notice it was ever there."[127] All of these improvements increase the capacity and accuracy of creative work flows. This means more advanced digital art in the form of videos, photos, and graphics. The down side to this kind of innovation in the work flow is that these tools could decrease the value of this highly specialized field and affect one of the main ways working artists make money.

AI's progression in viability has put it in a position to be used by a large group of mainstream adopters. It is poised to change the way creatives think about and engage in their professional and artistic workflows. The new skills needed will be anchored in a firm foundation of artistic training and art history. It is clear, with the continued investment and increased accessibility of AI image makers, that they are going to be rapidly changing the landscape of art making.

[126] Knight, "AI Makes Art."

[127] Tom May, "Why Adobe Software Is Changing, and What It Means for the Future of Creativity," Creative Boom, October 25, 2022, https://www.creativeboom.com/resources/why-adobe-software-is-changing-and-what-it-means-for-the-future-of-creativity/.

Conclusion

AI is clearly starting new conversations about what art is and where art will be in the future. In this research, we illustrate how the current discourse around AI is reminiscent of the discourse around the invention of photography in the nineteenth century. Innovation has always had an impact on society as evidenced by the many conversations and works they inspired. Whether in favor of the current popular innovations or not, we are witnessing a society grappling with another paradigm-shifting moment. Investigating the many moments innovation has influenced our society gives us an idea of the possible resistance or acceptance that may be present in their wake. In relation to understanding where AI image makers are in relation to adoption and diffusion, the current discourse around AI is an example of the communication phase of the diffusion model by Rogers. Thinking about how influential the camera and photography have been, and realizing that the discourse is similar can give us perspective. We are witnessing another major technological shift in the arts. A shift that is worth conducting further research so as to understand the many implications that come with it.

The three case studies were enlightening because of the insight they provided. Obvious Art Group was one of the main inspirations for this thesis because of the major headlines they produced in 2018. The problematic part of their story is that it is hard to make a case for them becoming the face of the AI art community in the public. Using borrowed code that produced similar images to the original coder's work is not innovative. Their reluctance to give credit to the open source community—and more specifically to Robbie Barrat—was troubling because this collective community did the bulk of the work. Furthermore, their marketing strategy was also misleading and not representative of the true nature of AI art. AI is not autonomously making work and putting together clever concepts for artistic appreciation. An artist's hand is still present and the coder's touch is visible. We can make a case that many others should have had the opportunity to present their work at Christie's. For example, artists like Rashed Haq or Mario Klingemann have more visually compelling compositions that are supported with deeper concepts using the same GAN models. However, their case study was useful because it brings much deserved attention to this budding art community. AI art production quality has progressed immensely since Obvious Art Group. Spending time with

some of the early adopter types like Rashed Haq shed light on the many ways these innovators have strived to reinvent the image and the image-making process. Haq's experimentation and the resulting art was a clear example of how these innovative minds are working on the edge of innovation in new media art. Boris Eldagsen was an interesting case study which allowed us to see what the future AI artist would look like as mainstream adopters start to work with AI image makers. His experimentation with prompts and working in and around censorship models to create unique work is an example of how the next users will be pushing these AI text-to-image generators to new ends. These case studies present a small microcosm of the overall macrocosm of the emerging AI art world. They represent a look into the current state of where AI art innovation is and the types of artists working in these new ways.

Researching how AI image makers have arrived to where they are today makes us wonder where things could possiblly go in the future. We do know that AI is becoming more of an influence on our creative tools as companies slowly add AI into their creative suite of programs. The main focus of this thesis was on text-to-image AI and their possible influences. From a photography perspective, it does appear that stock photography will be becoming less of a financial opportunity as programs like DALL-E can create photorealistic images within minutes at a low cost. Will there still be need for authentic photography? Yes, of course, people will still want photos of Grandma, but the market for generic images could possibly shrink or become less lucrative. The opportunities of AI image makers allow users to create many images on demand that can suit many creative needs outside of custom work—a potential problem for those who have not adapted their skills. Even though text-to-image sounds easy, it is not. Crafting prompts and guiding AI still required a base of artistic knowledge and many artistic technical skills that may go beyond the average user. The difference in the future is that artists will be tasked with interpreting their knowledge through language. We believe there will be a place for digital artists in the future with AI, but the skills set will definitely change.

One of the main challenges in the research and writing for this thesis is that text-to-image AI made radical jumps in accessibility during the writing of this thesis. Many of the articles referenced were written within the last few months. New headlines and topics are being

brought up daily as these systems take the art world by storm. There are many articles that talk about the origins of AI, but little has been written about this new text-to-image AI trend. The main innovations consist of the changing approaches in GAN models and a new method called “Diffusion” which has improved image quality. Large amounts of money have been going into perfecting these models and building easy-to-use interfaces for artists. The release of Midjourney and Stable Diffusion changed the way people looked at the models, because the image results created were ground-breaking in their detail and their capability to create some wild request with dramatic accuracy. In a short amount of time, artist have been able to create compelling work that have won art competitions.[128] Considering these systems have recently been released in the last six months, artists can now create highly detailed work with a short learning curve. This rapid innovation is happening very quickly and the amount of content documenting this shift is limited in depth of coverage.

Given that this specific topic is still new from a research standpoint, further research is still needed in different directions. AI brings up many curious questions of ownership and copyright laws. Do laws on the books in our governments have the correct protections in place to protect copyrights and intellectual property? Many of the text-to-image AI generators own rights to the images. Do creators have a claim to the images created? If so, how much? Going a step further, do images that were used in training databases have a copyright claim—even though the images created as a result are not direct reproduction? These issues need further consideration and deeper research to discover the limitations and possible problems in our laws. This leads to another angle worth exploring in AI: the concerns around censorship in the algorithms was raised many times in our research. DALL-E and Midjourney are popular programs that many artists are using to make new work but there are limits to what an artist can make. These limits are usually around NSFW content. They limit the ability of the system to craft real people or pornographic content. Are these limitations necessary and is this censorship limiting creativity and by extension free speech? A controversial release of a program called Stable Diffusion allows users to turn off these safe guards, they are willing to let people do what they do without limits. Imitating real people is a real concern and could influence society in many unknown ways. However, a look at history makes us wonder where

[128] Roose, “Won an Art Prize.”

we would be without satire and the freedom to create work that goes against the grain? AI has many worthy angles to explore. AI is in the process of changing the world around us. Only time will tell what the implications of this change will be.

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