

Maryam M. Hassan

*Department of Photography, Cinema and Television, Faculty of Applied Arts, 6th
October University, Egypt*

Postdoctoral Fellow, Academy of Dramatic Art, University of Zagreb, Croatia

The Impact of AI on Transforming Concepts in Contemporary Photography

Abstract: The integration of AI, particularly deep learning, has significantly altered the landscape of photography, offering tools that redefine workflows and expand creative horizons. AI enables photographers to create new images and manipulate existing ones, thereby pushing the boundaries of artistic expression. However, this capability also raises concerns about the blurring of lines between authorship and originality. This research investigates AI's impact on traditional photography, with a focus on creativity and authorship, particularly through technologies like GANs and AICAN. The study examines how AI-generated images challenge the distinction between reality and fiction, influencing the art and reshaping concepts of creativity in AI-produced works. As the distinction between truth and falsehood becomes increasingly blurred in a world of misinformation, the research explores AI's role in deepening this crisis. The research problem centers on the need to re-evaluate the role of photographers as AI takes over many photographic tasks, raising questions about how this technology redefines artistic creativity, authenticity, and authorship. The study questions whether artistic vision and the human touch will remain crucial or if the focus will shift toward collaborative creativity between humans and AI. The significance of this research lies in its ability to provide insights into AI's impact on photography, helping navigate the future of this art form. This research aims to analyze the artistic and expressive qualities of concrete examples of artificial intelligence applications in photography, as well as to deconstruct the concepts of art, creativity, authorship, and authenticity in photographic artworks considering modern technology.

Keywords: photography; GAN; authenticity; artificial intelligence; AICAN.

Introduction

Historically, photographs held an authoritative status; altering them was often equated with altering memory and, by extension, history. Humans rely heavily on sight to distinguish between reality and fiction, and therefore images were granted a high degree of credibility in defining truth. As researchers İsmail Erim and Mehmet Emin note, “images still hold significant credibility regarding the issue of truth.”¹

¹ İsmail Erim Gülaçtı and Mehmet Emin Kahraman, “The Impact of Artificial Intelligence on Photography and Painting in the Post-Truth Era and the Issues of Creativity and Authorship,” *Medeniyet Sanat – İMÜ Sanat Tasarım ve Mimarlık Fakültesi Dergisi* 7, no. 2 (2021): 244, <https://doi.org/10.46641/medeniyetsanat.994950>.

However, with its advanced capabilities in image generation and processing, AI has revolutionized areas such as image recognition, analysis, and smart editing. For instance, social media platforms like Facebook employ AI algorithms to recognize faces and suggest hashtags, enhancing user experience.

This technological shift has redefined creative thinking, traditional concepts about images credibility. Photographers are no longer limited to documenting reality; they can now explore imaginative realms through generative algorithms. These tools allow artists to express their ideas and emotions with unprecedented freedom, fostering the development and reinterpretation of artistic concepts.² However, these advancements come with challenges, particularly regarding privacy violations and ethical concerns.

Through George Gerbner's Cultivation Theory, which suggests that constant exposure to media reshapes our perceptions of reality, with the proliferation of artificially altered and AI-powered images, the lines between 'truth' and 'representation' are shifting. For example, malicious AI applications capable of removing clothing from individuals in images have eroded traditional aesthetic standards and blurred the line between reality and fiction.³ This raises concerns about image credibility and the potential to mislead audiences, who may struggle to discern the authenticity of what they see. A striking example is a photograph by Boris Eldagsen, (Figure 1) created using AI, which controversially won the first prize in a global photography competition.⁴

Some artists fear that the widespread adoption of AI-generated imagery, due to its cost-effectiveness and efficiency, may lead to a fundamental shift in societal values regarding art and artists. According to Kant's aesthetic theory, beauty is associated with a contemplative experience that transcends utility. However, AI-powered images raise questions about whether an artwork can be considered 'beautiful' if it was created without actual human intervention. On the other hand, the sale of a GAN-generated painting of Edmond de Belamy at Christie's for \$432,500 (Figure 2) reflects a debate about redefining artistic authenticity. This debate connects to Walter Benjamin's theory of the "aura" of an artwork, which highlights the importance of the historical and cultural context of an artwork in conferring its unique value.⁵

Aesthetic reception theory emphasizes that the audience gives an artwork its meaning through their perceptual and interpretive experience. With the advent of AI-generated images, the viewer is challenged to distinguish between human creativity and algorithmic fabrication. Yet, the question of how long images will retain their credibility remains unresolved in an era where truth – defined by physical, historical,

² Zeyu Tang, "The Transformation of Photography by Artificial Intelligence Generative AI Technology," *Journal of Artificial Intelligence Practice* 6 (2023): 57, <https://doi.org/10.23977/jaip.2023.060809>.

³ CBS News, "AI 'Nudify': The Impact, Law Changes, and the Fight," last modified December 24, 2023. accessed January 3, 2025, <https://www.cbsnews.com/news/ai-nudify-impacts-law-change-fight-60-minutes/>.

⁴ Paul Glynn, <https://www.bbc.com/news/entertainment-arts-65296763>.

⁵ Yongcai Chen, "Artificial Intelligence Technology in Photography and Future Challenges and Reflections," *The Frontiers of Society, Science and Technology* 6, no. 6 (2024): 24, <https://doi.org/10.25236/FSST.2024.060605>.

epistemological, and sociological criteria – is increasingly challenged by more subjective and diverse perspectives.⁶

Just as digital photography and Photoshop sparked debates over authenticity, authorship, and manipulation, AI-generated imagery raises similar concerns about the erosion of traditional artistic boundaries. Fred Ritchin argues that the shift from analog to digital photography fundamentally altered the perception of truth in images, as manipulation became seamless and widespread.⁷

Martin Lister highlights how digital technologies reshaped photography, making the image more malleable and distancing it from its traditional indexical relationship with reality. Similarly, AI-generated art raises questions about human agency, creativity, and the role of artist in an era where machines can autonomously produce compelling visuals.⁸

Finally, addressing issues of regulation and copyright is essential to ensure the responsible and sustainable integration of generative AI in creative practices.⁹

As AI continues to advance in image generation, a pivotal question emerges: Can a machine truly replicate human creativity and capture that ‘decisive moment’? While AI can produce visually stunning and realistic images, it lacks the core human element: emotion. Artistic creativity transcends technique; it reflects the human soul and lived experience. The absence of human sentiment in AI-generated images challenge the nature of art and beauty. Can art be meaningful if it lacks traces of human emotion? Can an image evoke our feelings if it merely simulates a reality devoid of experience? Many fear that AI’s dominance in creative processes may diminish the intrinsic value of art. If anyone can generate artistic images at the push of a button, what will distinguish genuine artistic work? What value will future generations seek in art?¹⁰

The concept of artificial intelligence (AI)

Since Alan M. Turing posed the pivotal question “Can machines think?” in his groundbreaking 1950 paper “Computing Machinery and Intelligence”, the field of artificial intelligence (AI) has made steady progress toward developing machines capable of ‘thinking’. Over the past six decades, AI research has centered on machine learning, enabling machines to identify patterns in data and draw conclusions with a minimum of human intervention.¹¹

AI, a branch of computer science, seeks to replicate human cognitive abilities. Early AI research in the 1970s adopted a classical approach, relying on analytical

⁶ Gülaçtı and Kahraman, “The Impact of Artificial Intelligence on Photography,” 244.

⁷ Fred Ritchin, *After Photography* (W. W. Norton & Company, 2008), 24–27.

⁸ Martin Lister, “Photography in the Age of the Electronic Image,” in *Photography: A Critical Introduction*, ed. Liz Wells (John Libbey and Co Ltd., 2006, 313–400.

⁹ Tang, “The Transformation of Photography by Artificial Intelligence,” 57.

¹⁰ Govind Bhattacharjee, “Art and Photography in the Age of Artificial Intelligence,” in 12th International Photographic Conference of PAD (Kolkata, 2023), 4,

¹¹ Gülaçtı and Kahraman, “The Impact of Artificial Intelligence on Photography,” 246–47.

methods that considered all available data to solve problems. This evolved into ‘expert systems,’ where accumulated expert knowledge addressed complex issues through ‘if – then’ rules rather than procedural codes. Expert systems simulate human decision-making, laying the groundwork for modern AI powered by machine learning and artificial neural networks (ANNs), which mimic the human brain’s learning processes. Machine learning involves algorithms that discover patterns and generate insights, progressing through steps like data analysis, rule discovery, reasoning, self-correction, and prediction.¹² Today, machine learning is central to AI, fueled by advanced algorithms, superfast computers, and vast datasets known as Big Data Quantum computing, surpassing the limits of Moore’s Law, and further amplifying AI’s potential. Applications include self-driving cars, language translation, facial recognition, and image-altering tools, all benefiting from the integration of massive datasets and affordable storage.

Among various tools for machine learning, supervised learning stands out as one of the most significant. This method involves training systems on labeled datasets, enabling them to map inputs to correct outputs.¹³ Although supervised learning has existed for years, its effectiveness has grown due to improvements in AI system performance and the availability of large datasets.¹⁴

A major challenge in advancing machine learning lies in our limited understanding of how the human brain learns – a remarkably efficient system. Furthermore, there is no universally accepted definition of intelligence. However, it is widely agreed that intelligence encompasses perception, understanding, learning, reasoning, decision-making, interaction, and the application of knowledge to achieve goals. Using advanced algorithms and models, AI systems analyze vast data, identify patterns, and make decisions based on these insights.¹⁵

The more data a machine processes, the better its patterns and predictions become. Unlike traditional programming, machine learning enables systems to program themselves. However, despite these advancements, machines remain unable to generalize abstractions – a distinctive feature of human consciousness that current AI systems have yet to replicate.¹⁶

In this research, GANs and AICAN were chosen as key models to examine the impact of artificial intelligence on photography. GANs play a crucial role in image generation and transformation through deep learning and advanced editing techniques. Meanwhile, AICAN is an AI model focused on independent artistic creativity, offering insights into AI’s role in visual arts. GANs are widely used for enhancing image quality, restoring old photos, and style transformation, whereas AICAN produces

¹² Chen, “Artificial Intelligence Technology in Photography and Future Challenges,” 25.

¹³ Bhattacharjee, “Art and Photography,” 5–6.

¹⁴ Chen, “Artificial Intelligence Technology in Photography and Future Challenges” 25.

¹⁵ Omar Ballester, “An Artificial Intelligence Definition and Classification Framework for Public Sector Applications,” in DG. O2021: The 22nd Annual International Conference on Digital Government Research (Association for Computing Machinery, 2021), 67–69, <https://doi.org/10.1145/3463677.3463709>.

¹⁶ Chen, “Artificial Intelligence Technology in Photography and Future Challenges,” 25.

AI-generated artworks sold as independent pieces. Given their influence on artists and photographers, studying these models is essential to understanding AI's transformative impact on contemporary photography.

Generative Adversarial Networks (GANs)

Introduced by Ian Goodfellow and colleagues in 2014, GANs are a key component of artificial intelligence (AI) and deep learning. GANs involve two neural networks – a generator and a discriminator – that compete in a process where one ‘wins’ by generating artificial data indistinguishable from authentic data. GANs are widely used for creating images, videos, and audio ¹⁷ (Figure 3).

The generator creates new data by modifying characteristics of random samples from a training set, aiming to deceive the discriminator into accepting it as real. Meanwhile, the discriminator distinguishes between real images from the training set and fake ones generated by the generator, striving to identify legitimate inputs. Both networks continually improve, enhancing their respective abilities to create and evaluate data. Goodfellow compares the generator to counterfeiters and the discriminator to law enforcement, highlighting their evolving proficiency. By training GANs, AI captures insight into our world's structure and operations.¹⁸

Artificial intelligence using in photography

The integration of Generative AI technology into photography has brought transformative changes to both its technical and creative dimensions. Up to a point creating photographs required a series of intricate steps, including shooting, editing, and post-processing, which demanded advanced skills and expertise. However, Generative AI has significantly simplified these processes, reducing the technical barriers for photographers.¹⁹ Today, digital cameras equipped with AI technologies offer numerous automated functions, such as object recognition, preset selection, and precise focus determination. AI optimizes camera settings for various scenes and even adjusts the positioning of the lens to align with the optical characteristics and desired composition.

Additionally, AI-powered editing tools enable highly advanced photo manipulation, allowing for the seamless creation of images that can alter reality with remarkable precision.²⁰ This raises concerns about the growing difficulty of distinguishing between genuine and manipulated imagery. This technological revolution has also transformed creative thinking in photography. Traditional approaches emphasizing realism and objectivity, particularly in documentary and news photography, have given way to new possibilities. Photographers are no longer limited to capturing reality

¹⁷ Chris V. Nicholson, “A Beginner’s Guide to Generative Adversarial Networks (GANs),” Pathmind, 2020, <https://wiki.pathmind.com/generative-adversarial-network-gan>.

¹⁸ Gülaçtı and Kahraman, “The Impact of Artificial Intelligence on Photography,” 245.

¹⁹ Tang, “The Transformation of Photography,” 58.

²⁰ Bhattacharjee, “Art and Photography,” 5.

as it exists. Instead, they can use generative algorithms to craft artistic works that reflect personal and imaginative visions. Such a radical shift in the art world is clearly evident in the project of the American artist Trevor Paglen entitled “From Apple to Anomaly” (Figure 4), showcased at the Curve gallery in Barbican.

The project includes about 30,000 color images collected from one of the primary datasets used to train AI machine learning systems, the ImageNet dataset, which contains over 14 million images divided into more than 21,000 categories, serving as a vital resource for AI training. Paglen’s work demonstrates how AI technology can redefine artistic expression by expanding the boundaries of creativity. His project highlights the potential of AI as a tool for innovation in the visual arts, inviting reflection on its role in shaping the future of artistic practices.²¹

Artificial intelligence’s role in advancing photography technology

Cameras

Modern cameras have revolutionized photography by leveraging artificial intelligence (AI) and neural networks to enhance image quality. These systems analyze each frame, adjusting tones based on the unique environment of the shot. By referencing vast image databases, the AI identifies necessary edits in real-time, much like receiving guidance from someone with extraordinary memory. This process, powered by deep learning, ensures optimal adjustments tailored to each photograph.²²

Facial recognition technology plays a pivotal role in identifying human faces in photos and videos by scanning scenes in real time. It prioritizes facial focus, eliminating the need for direct auto-focusing on individuals’ faces, thereby streamlining the capture of portrait images.²³

AI’s ability to recognize the environment allows cameras to analyze scenes and identify elements such as the sky, people, and objects. This capability enables the camera to focus on the foreground subject while simulating a shallow depth of field, keeping the subject sharp and beautifully blurring the background for visually stunning portraits. AI-powered cameras can also recognize objects in a frame, assisting autofocus in prioritizing these elements. Modern DSLR cameras integrate advanced lens technology with AI to continuously improve performance. These systems analyze extensive image databases, providing recommendations for capturing the best photo based on scene analysis. Moreover, they learn user preferences from shot history, retrieving specific settings for objects and faces, like how online platforms suggest products based on browsing history.

As lenses have improved and sensors have become more efficient, camera hardware now includes central processing units (CPUs), image signal processors (ISPs), and neural processing units (NPUs). These components work together to deliver

²¹ Tang, “The Transformation of Photography,” 58.

²² Gülaçtı and Kahraman. “The Impact of Artificial Intelligence on Photography,” 245.

²³ Emre Ozen, Fikret Alim, Sefa Burak Okcu, Enes Kavakli, and Cevahir Cigla, “Real-Time Face Recognition System at the Edge,” in *Signal Processing, Sensor/Information Fusion, and Target Recognition XXXIII*, ed. Ivan Kadar, Erik P. Blasch, Lynne L. Grewe, Proc. of SPIE Vol. 13057, 2024, <https://doi.org/10.1117/12.3013671>.

intelligent, real-time image enhancements, elevating the art of photography to unprecedented creative heights.²⁴

Automatic image classification and labeling

Social media platforms like Instagram and Facebook utilize machine learning algorithms and deep learning models to automatically recognize objects, scenes, and features in images, enhancing image management and search efficiency.²⁵ A breakthrough in this area was the launch of Google Photos in 2015. While machine learning had been used for image classification in Google+, the transformation of unclassified user-uploaded photos into searchable databases marked a significant shift. Using supervised learning, the self-learning algorithm is trained on millions of images to identify, label, and enhance image categories. Apple has since adopted similar methods, but Google remains a leader in this field.

Artificial intelligence's role in enhancing creativity in photography

Inspiration and creating image

Techniques such as (GAN) allow the creation of new images or composite multiple images and the merging of images (image fusion) into one image, which expands the scope of photographic creativity. The AI application (Midjourney) can create artistic photographs that match a description based on keywords provided by the user, and we can set prompt to convert the image to Pixar style as in Figure 5.²⁶

Transforming photographs into paintings

The ability to create paintings from abstract ideas or concrete descriptions has long been considered uniquely human, unmatched by animals or machines. Artistic expertise in the fine arts remained exclusive to humans until the emergence of GANs. Previously, no clear method existed for generating paintings through algorithms based on specific inputs. However, as Yi et al.²⁷ demonstrate, advances in deep learning have transformed image design, allowing neural networks to reimagine photographs as remarkable artworks.

Figure 6 showcases this capability, where a single photograph is rendered in the styles of iconic works such as *The Shipwreck of the Minotaur* (1805) by J.M.W. Turner, *The Starry Night* (1889) by Vincent van Gogh, *The Scream* (1893) by Edvard Munch, *Femme nue assise* (1910) by Pablo Picasso, and *Composition VII* (1913) by Wassily

²⁴ Reese Grimsley, "Edge AI: Real-Time Face Detection and Recognition," Texas Instruments, 2023, accessed April 6, 2025, <https://www.ti.com/lit/wp/sprad74/sprad74.pdf>.

²⁵ "Programming Image Classification with Machine Learning: Why and How?" Kili, accessed on April 6, 2025, <https://kili-technology.com/data-labeling/computer-vision/image-annotation/programming-image-classification-with-machine-learning>.

²⁶ Chen, "Artificial Intelligence Technology in Photography and Future Challenges"²⁶

²⁷ Ran Yi, Yong-Jin Liu, Yu-Kun Lai, and Paul L. Rosin, "Generating Artistic Portrait Drawings from Face Photos with Hierarchical GANs," in *Proceedings of IEEE Conference on Computer Vision and Pattern Recognition (CVPR '19)* (Long Beach, CA, USA, 2019), 10735–10744.

Kandinsky. Furthermore, GANs enable the conversion of paintings by masters like Monet into highly realistic photographs, as illustrated in Figure 7.

The evolution of algorithms has given rise to remarkable tools like the “Deep Dream” algorithm, developed by engineer Alexander Mordvintsev. Considered one of the most unconventional artificial intelligence algorithms, Deep Dream emerged from efforts to visualize the internal workings of neural networks. It soon gained recognition as an artistic tool, notably featured in the project “Inceptions: Going Deeper into Neural Networks” where it was applied to a variety of images, including photographs.

The Deep Dream generates surreal, dream-like visuals by amplifying patterns within an image, producing results often likened to the effects of hallucinogenic substances like LSD. The algorithm operates on convolutional neural networks (CNNs), which learn through layered processes. Early layers identify basic features such as edges and colors, while later layers recognize complex patterns like shapes and faces. Figure 8 illustrates how the Deep Dream transforms images into fantastical and supernatural creations.

(GANs) showcase remarkable artistic capabilities when trained on extensive datasets. Tasks once deemed challenging, even for skilled artists – such as replicating Monet’s or Cézanne’s styles – can now be effortlessly achieved with speed and precision. While AI-generated creations have yet to be recognized as masterpieces or traditional photographs, GANs are advancing rapidly in artistic concepts and creativity once considered uniquely human. This evolution highlights the growing intersection between art and technology, shaping a new dimension within our visual culture and redefining the boundaries of artistic expression in an era increasingly influenced by artificial intelligence.²⁸

Custom adjustments

AI drawing programs, like the GAN Paint Studio by MIT and IBM, enable users to adjust parameters for optimizing images to suit creative needs. These tools allow photographers to control details, add or remove objects, and craft imaginary scenes, aligning visuals with their artistic vision (Figure 9). Hays and Efros introduced an innovative approach to image completion that moves beyond traditional techniques, which typically rely on reconstructing missing areas using data from the original image. Instead, their method leverages a vast collection of unlabelled images, significantly improving results where previous techniques – and even skilled editors – often fall short. Their study highlights the critical role of big data in enhancing image completion, demonstrating that expanding the dataset from 10,000 to 2 million images led to a notable increase in accuracy and realism. They propose a web-based application where users can upload incomplete images, which are then matched with suitable content from large online databases like Flickr and Picasa, making advanced image restoration more accessible and user-friendly.²⁹

²⁸ Gülaçtı and Kahraman, “The Impact of Artificial Intelligence on Photography,” 251–52.

²⁹ James Hays and Alexei Efros, “Scene Completion Using Millions of Photographs,” *Computer Graphics Proceedings*, Annual Conference Series, 2007, 1–9.

Image editing and post-processing

AI leverages deep learning models and image processing algorithms to adjust exposure, contrast, and color balance, automatically enhancing and restoring images while fixing defects and noise to improve quality.³⁰ Zenfolio's *State of the Photography Industry 2023* report (Figure 10) shows nearly 50% of photographers have adopted AI in their workflow, with only 11% viewing it as harmful. The survey found 41% aim to reduce editing time, and 34% streamline tasks using AI, emphasizing its increasing role in optimizing photography processes.

Reanimated photographs

The concept of reanimating people through computer-generated images has been around since the 1980s, long before the introduction of GANs in the early 21st century. However, recent advancements in AI are set to revolutionize the art of photography. This technology enables the recreation of lifelike representations of individuals, a development that elicits mixed reactions (Figures 11, 12). For some, the idea of bringing loved ones back to life through AI is unsettling and raises ethical concerns. For others, it represents an exciting breakthrough in photographic innovation, akin to the awe experienced when the first photograph was unveiled at the French Academy of Sciences in 1839.³¹

Image quality enhancement

Upscaling is the process of increasing the resolution of a digital image by increasing the number of pixels to obtain a clearer image. It is now possible to 'enhance' low-quality images to produce a better image. For instance, an image with a resolution of 0.8 megapixels can be upscaled to a resolution of 3 megapixels. All a photographer needs to do is capture a few images, even using a mobile phone, and then synthesize them using GANs.

Image colorization

Artistic applications of GANs have revolutionized the colorization of old black-and-white photographs, as shown in Figures 13 and 14.

Unlike traditional tools like Adobe Photoshop, which often produce dull and distorted results with color perception loss, GANs effectively learn and restore colors, addressing the colorization challenge. Through this process, GANs replace lost or damaged details, enabling realistic artistic restoration.³²

³⁰ Kai Zhang, Wangmeng Zuo, Yunjin Chen, Deyu Meng, and Lei Zhang, "Beyond a Gaussian Denoiser: Residual Learning of Deep CNN for Image Denoising," *IEEE Transactions on Image Processing* 26, no. 7 (2017): 3142–55, DOI: 10.1109/CVPR.2019.01100

³¹ Gülaçtı and Kahraman, "The Impact of Artificial Intelligence on Photography," 248–49.

³² Gülaçtı and Kahraman, "The Impact of Artificial Intelligence on Photography," 252.

Challenges and critical perspectives on AI in photography

In a YouTube interview, Pye discusses with professional re-toucher Pratik Naik the threat that AI poses to creators and how this new technology is redefining the industry as we know it,³³ and how it could cause a loss of personal style. Here are some of the issues raised about AI and its application in photography:

Distortion of reality

The use of AI in image processing raises debates about image manipulation, distortion, and the ethical concerns surrounding the overuse of filters. AI can generate images that closely resemble reality, blurring the line between real and fictional photography. This hyper-realism can deceive viewers, challenging the credibility of images, especially in fields like photojournalism and forensic evidence. AI can alter facial expressions, lighting, colors, and other elements, making fake images appear more natural and realistic.

Consequently, photographers must be aware of the ethical implications. However, some argue that machines merely simulate human creativity, with further experimentation required to match human artistic processes. On the contrary, some suggest that artists often draw inspiration from other works or blend elements from various art styles to create something new and innovative. In this context, machines are merely simulating human actions, and achieving a level of consistency and comparison with the human creative process requires further experimentation.

Job loss

The widespread use of AI in photography may lead to photographers becoming overly dependent on technology, potentially losing basic skills. Furthermore, automation of tasks like editing and post-processing could result in job displacement, eliminating roles such as photo editors.

Privacy and data security

AI technologies require vast amounts of data for image recognition and processing, raising concerns about privacy and security. Since GANs rely on image data from photographers and users to train AI models, the question is whether individuals will accept or reject using their personal photos, shared on social media, to create realistic images. It is pivotal to ensure proper protection of this data's privacy and security.

Copyright issues

Intellectual property rights are a major concern as AI develops rapidly, opening discussions about the risks of copyright violations and artist style distinction.³⁴ For

³³ Adorama, "The Impact of AI-Generated Art on Photography & Creative Pursuits | Master Your Craft," 2022, YouTube, <https://www.youtube.com/watch?v=h0yKcyWHf1I&t=17s>.

³⁴ Yongcai Chen, "Artificial Intelligence Technology in Photography and Future Challenges and Reflections," *The Frontiers of Society, Science and Technology* 6, no. 6 (2024): 27–28, <https://doi.org/10.25236/FSST.2024.060605>.

example, determining the intellectual property rights becomes complicated if brand products are used to generate new designs through GANs. Thus, considering the rapid growth of the AI-driven art market, addressing copyright issues has become more urgent, and the expansion of this market requires the creation of clear legal and ethical frameworks to protect the rights of all parties involved.³⁵

Deconstructing core concepts

The essence of photography

The industrial revolution created a confusing relationship between machines and humans significantly influencing artistic production and distribution methods. Today, AI echoes a similarly intricate dynamic between technology and art, prompting a reevaluation of photography's essence.

Photography, a powerful means of expressing emotions and documenting moments, as photographer Henri Cartier said, "Photography is not like painting; when you take a picture, your eye must see a composition or an expression that life itself offers you, and you must know intuitively when to trigger the camera". This 'decisive moment' as he called it,³⁶ embodies the essence of photographic creativity – a fleeting moment that a machine cannot replicate.

The photographer is thus an active agent who has absolute control over the artwork, through compositional choices, exposure, and camera angles.³⁷ In addition, one of the indispensable aspects of photography is the need to establish contact with the subject.³⁸

But the essence of AI is that it relies on collecting thousands of images and data and analyzing them within known artistic patterns to produce images, and it is unable to invent a completely new artistic style. So, although AI opens new horizons for photographers, it also restricts the subjectivity of the artist, leading to homogeneous works and a lack of diversity.³⁹

The originality and creativity

The longstanding debate over the definition and source of creativity raises a central question: can a machine be truly creative? This issue becomes particularly relevant in the context of AI-generated artwork. Generative adversarial networks (GANs) are fed artwork images, then identify common features, and generate entirely new images.⁴⁰

³⁵ Gülaçtı and Kahraman, "The Impact of Artificial Intelligence on Photography," 254.

³⁶ Michael Zhang, "Henri Cartier-Bresson on 'The Decisive Moment,'" Peta Pixel, March 12, 2020, <https://petapixel.com/2012/03/20/henri-cartier-bresson-on-the-decisive-moment/>.

³⁷ Tang, "The Transformation of Photography," 60.

³⁸ Chen, "Artificial Intelligence Technology," 28.

³⁹ Tang, "The Transformation of Photography," 60.

⁴⁰ Chen, "Artificial Intelligence Technology," 27.

The process depends heavily on the artist's selection of input images, which the GANs use to synthesize new outputs. The artist then reviews these generated images and selects the final one, which represents the artwork. This highlights that GANs still rely on human guidance and supervision, with the machine itself far from achieving creative independence, although the machine often loses its ability to simulate the inputs, resulting in unexpected or distorted images, which may indicate that machine learning is more independent and complex than it is.

Despite this, many art critics remain hesitant to evaluate AI-generated images, often focusing on the final product without fully considering the creative process that leads to these images. This skepticism is understandable, as AI-generated images can seem to merely imitate existing styles with minor modifications. However, when we examine the entire creative process, AI-generated art can be classified as conceptual art. The artist plays a central role in guiding this process.⁴¹ As Ismail Erim notes, "this type of art can be defined as conceptual art because what is artistic is not only the result but also the process and concept that leads to this result."⁴² This includes the artist's input data, the specific parameters of the generative network, and the decision-making process in selecting or discarding images.

Thus, if we focus only on the form of the generated images and disregard the underlying concepts, it could be argued that generative networks are just algorithms producing aesthetic forms. However, understanding the entire process reveals that the role of the human artist makes the result conceptual, rather than merely a product of machines. "This makes all the components art, not just the image generated by GANs, which means that the whole process is a partnership between humans and machines."⁴³ In time, artists may refine these techniques to create more complex and sophisticated forms of conceptual art.⁴⁴

However, the notion of AI-generated art as conceptual art raises important questions about creativity and authorship, causing challenges for both artists and the art market. For instance, if the dataset used to train the AI or the underlying algorithm is borrowed from another source, can the resulting art be considered entirely original, or just an extension of previous works? These questions complicate how artists present themselves as creators of AI-generated art. Some artists, like Mario Klingemann, have integrated AI's capabilities into their work, making it central to the creative process.⁴⁵

In conclusion, although AI can produce visually captivating art, it struggles to meet the essential purpose of art: conveying a human vision. The lack of human emotions and motivations in machine learning processes hinders its ability to create art with profound personal or emotional depth.

⁴¹ Marian Mazzone and Ahmed Elgammal, "Art, Creativity, and the Potential of Artificial Intelligence," *Arts* 8, no. 26 (2019): 1, <https://doi.org/10.3390/arts8010026>.

⁴² Gülaçtı and Kahraman, "The Impact of Artificial Intelligence on Photography," 261.

⁴³ Gülaçtı and Kahraman, "The Impact of Artificial Intelligence on Photography," 261.

⁴⁴ Mazzone and Elgammal, "Art, Creativity, and the Potential," 2.

⁴⁵ Gülaçtı and Kahraman, "The Impact of Artificial Intelligence on Photography," 261.

A new wave of creative art, not generative

In the previous approach, artificial intelligence is used as an artistic tool, while the creative process remains under the control of the artist through pre- and post-curation of images, as well as through the modification of the algorithm itself. This approach has produced many remarkable art works. Harold Cohen's program AARON (www.aaronshome.com) serves as an early prominent example of this type of art.

At the Art & AI Lab at Rutgers University, researchers conducted one of the most significant experiments to study the creative process and how art evolves from a perceptual and cognitive point of view. The researchers developed a system called "AICAN" a semi-autonomous artist. The model is based on a psychological theory proposed by Colin Martindale in 1990, which explores how artists assimilate prior art works to eventually reach a point where they break established styles and create new ones.⁴⁶

According to researcher Ahmed Elgammal, the "Creative Adversarial Network" (CAN), a type of Generative Adversarial Network, uses "stylistic ambiguity" to create new and innovative art.⁴⁷ The CAN works by balancing two opposing forces: one encourages the machine to follow existing artistic styles, while the other discourages it from copying those styles, promoting uniqueness instead. This process ensures that the art produced is both original and visually acceptable. This approach follows the 'least effort principle' from Martindale's theory, which suggests that art should not be too novel, or it risks being rejected by viewers.

Unlike the generative art processes discussed earlier, this method is intrinsically creative. There is no curation of a specific dataset; instead, the algorithm is exposed to a vast collection of 80,000 images spanning five centuries of Western art history. This process mimics the way an artist absorbs art history, without being confined to genres or styles. The generative process employed by CAN aims at innovation consistently surprising us with the diversity of art produced by AICAN. Figure 5 illustrates a variety of this artwork, while Figure 16 presents a reproduction of an iconic photograph.

Conclusions

This study examines the impact of artificial intelligence (AI) on modern photography, shedding light on its ability to redefine creativity, authorship, and originality. Through technologies like Generative Adversarial Networks (GANs) and AICAN, AI has opened vast creative possibilities, allowing photographers to craft visuals that push the boundaries of realism and imagination. These advancements underline AI's role in making photography more accessible, lowering technical hurdles, and enabling innovative artistic expression.

⁴⁶ Mazzone and Elgammal, "Art, Creativity, and the Potential," 2–4.

⁴⁷ Ahmed Elgammal, Bingchen Liu, Mohamed Elhoseiny, and Marian Mazzone, "CAN: Creative Adversarial Networks, Generating 'Art' by Learning About Styles and Deviating from Style Norms," in *Proceedings of ICCV* (Atlanta, 2017), 4, <https://doi.org/10.48550/arXiv.1706.07068>.

The findings highlight a significant shift in the photographer's role, evolving from a solitary creator to a collaborator working alongside technology. This evolution not only reimagines the creative process but also raises critical ethical questions around authorship, intellectual property, and the credibility of AI-generated visuals. Furthermore, the rise of AI-driven art has disrupted traditional art markets, where machine-generated works are gaining acceptance and substantial commercial value.

Despite its contributions, the study has limitations. It predominantly addresses the technical and artistic aspects of AI's integration into photography, leaving broader cultural and societal implications insufficiently explored. Additionally, it lacks a thorough investigation into how audiences across diverse cultural contexts perceive and engage with AI-generated art, an essential factor in understanding its broader impact.

Future research should prioritize these gaps, focusing on the societal and cultural dimensions of AI in photography and examining regional nuances in its adoption and reception. There is also a pressing need to establish ethical frameworks and delve deeper into audience perceptions to guide the responsible and sustainable use of AI in creative practices.

By redefining norms and fostering innovation, AI has undeniably reshaped the photographic landscape. This study emphasizes the necessity of a thoughtful and critical approach to leveraging AI's potential, ensuring photography remains a dynamic and meaningful art form in the era of artificial intelligence.



Figure 1: Boris Eldagsen's AI-generated photograph that won the Sony World Photography Award. Paul Glynn, "Sony World Photography Award 2023: Winner Refuses Award After Revealing AI Creation," BBC News, April 18, 2023, <https://www.bbc.com/news/entertainment-arts-65296763>.



Figure 2: Portrait of Edmond de Bellamy, created using AI, <https://news.artnet.com/market/first-ever-artificial-intelligence-portrait-painting-sells-at-christies-1379902>.

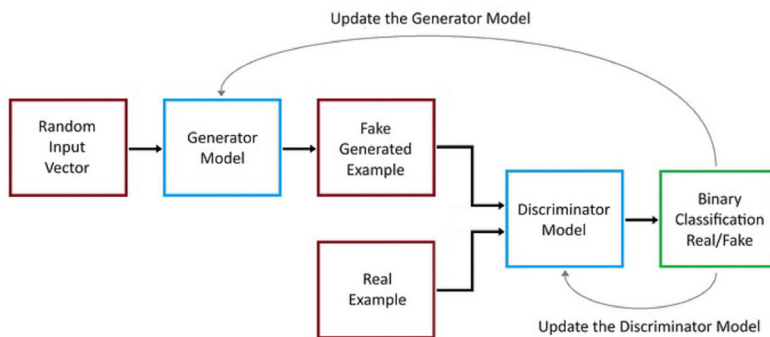


Figure 3: The working principle of GAN networks. The figure shows the tasks of the Generator network, <https://www.dio.me/articles/gans-redes-adversarias-generativas>.



Figure 4: A selection of images that form part of the project “From ‘Apple’ to ‘Anomaly,’” illustrating how the data on which AI systems were trained was used to generate innovative artistic expressions.

Trevor Paglen, “On ‘From Apple to Anomaly’” <https://www.barbican.org.uk/s/trevorpaglen/>.

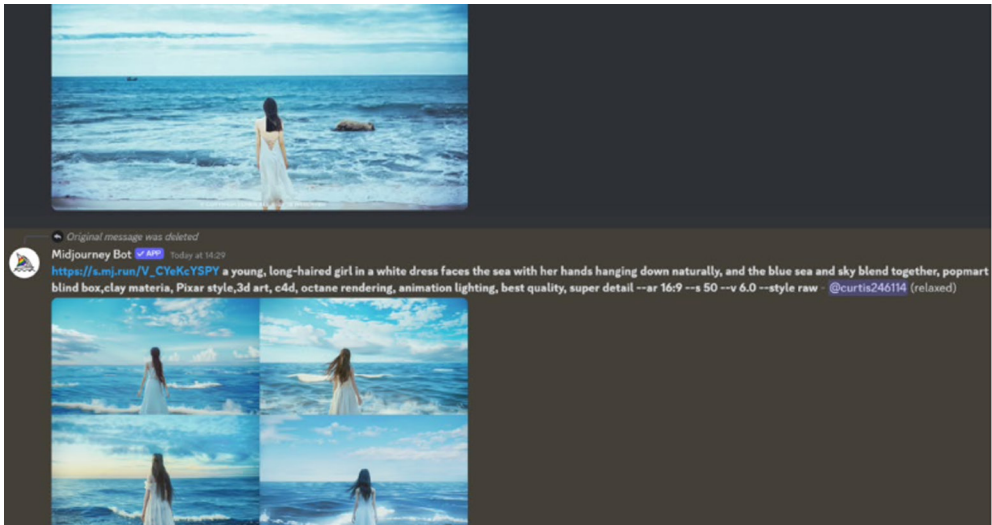


Figure 5: “Pixar style” by Jim Monge, Yongcai Chen, “Artificial Intelligence Technology in Photography and Future Challenges and Reflections,” *The Frontiers of Society, Science and Technology* 6, no. 6 (2024): 26, <https://doi.org/10.25236/FSST.2024.060605>.

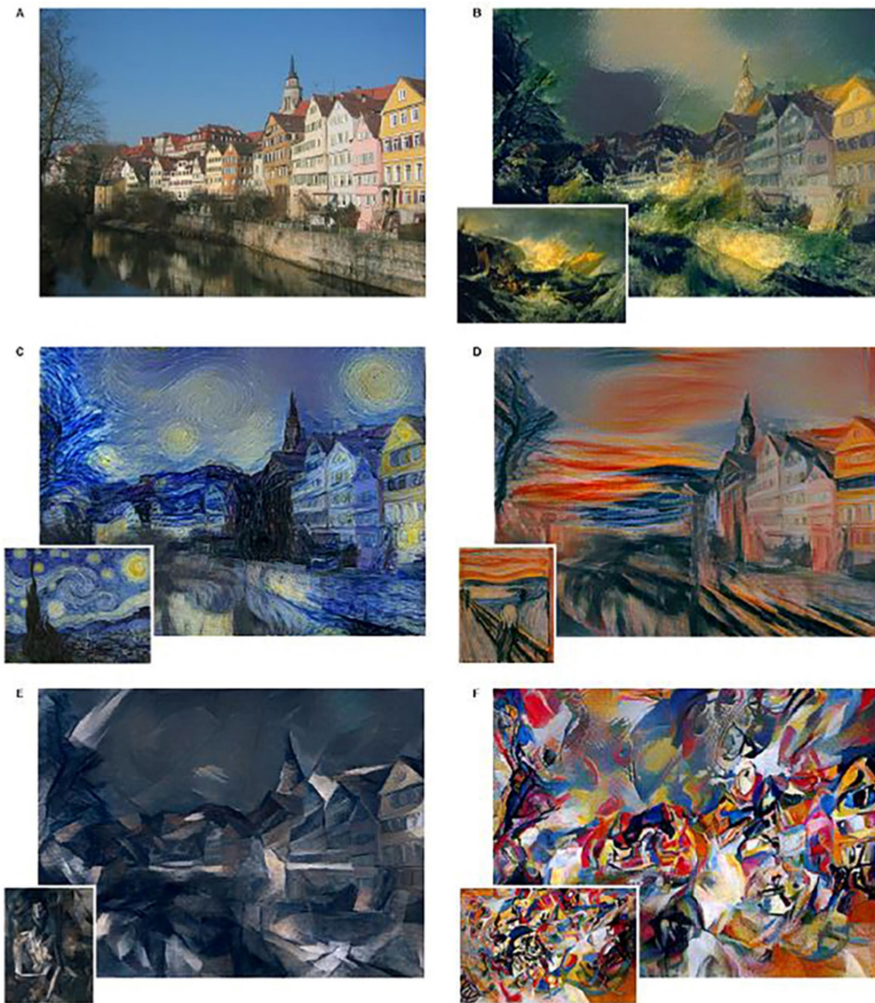


Figure 6: Converting photographs into styles of famous painters using GANs. Leon A. Gatys, Alexander S. Ecker, Matthias Bethge, “A Neural Algorithm of Artistic Style,” *Journal of Vision*, 16, no. 12 (2016): 1–16, <https://doi.org/10.48550/arXiv.1508.06576>.



Figure 7: Converting paintings of famous painters into photographs. Jun-Yan Zhu, Taesung Park, Philip Isola, and Alexei A. Efros, “Unpaired Image-to-Image Translation Using Cycle-Consistent Adversarial Networks. [Paper presentation],” *Proceedings of 2017 IEEE International Conference on Computer Vision (ICCV)*, Venice, Italy, 2017, 2242–51, <https://doi.org/10.1109/ICCV.2017.244>.

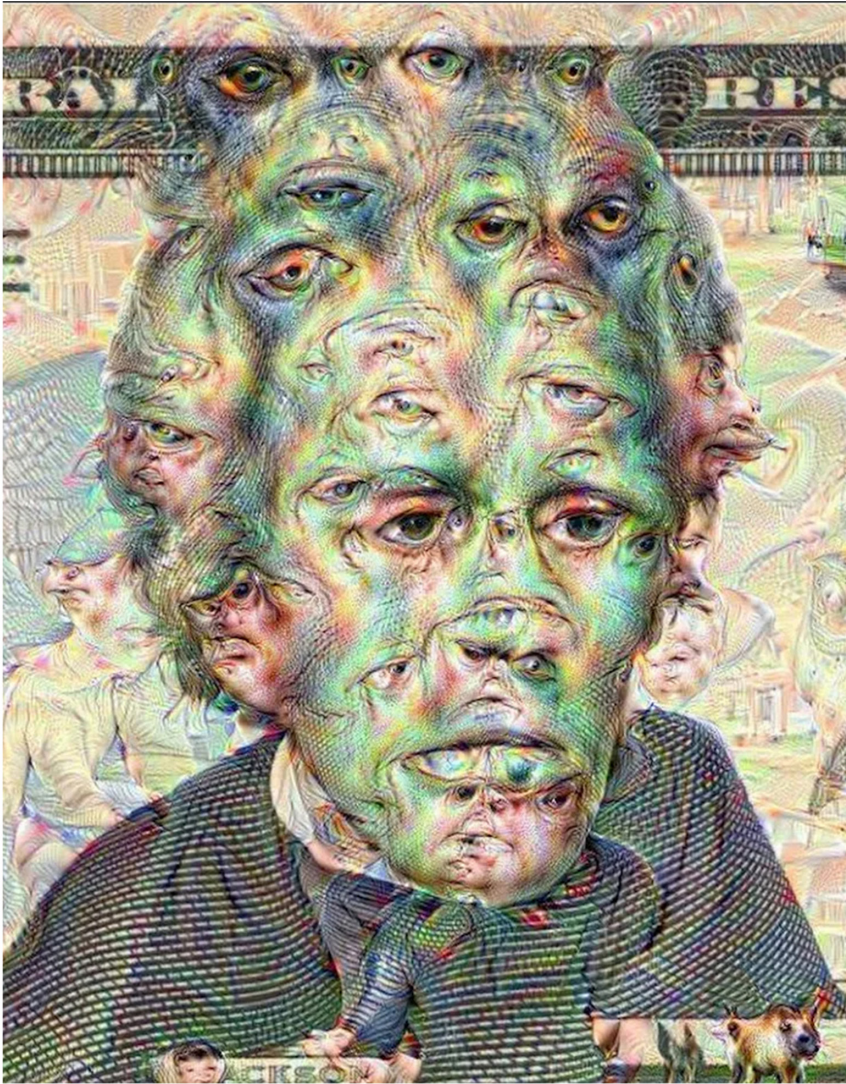


Figure 8: An example of what the Deep Dream algorithm produces, photo by Brad Saggs, in Mary-Ann Russon, “Google Deep Dream Robot: 10 Weirdest Images Produced by AI ‘Inceptionism’ and Users Online,” *International Business Times*, July 6, 2015, <https://www.ibtimes.co.uk/google-deepdream-robot-10-weirdest-images-produced-by-ai-inceptionism-users-online-1509518>.

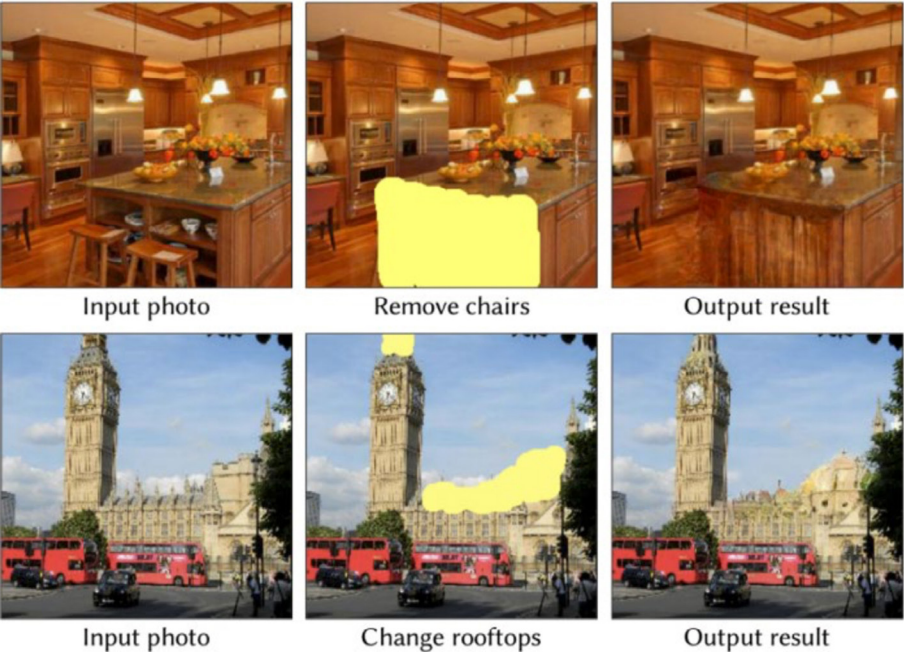


Figure 9: Manipulating semantic images using a generative primary image Yongcai Chen, “Artificial Intelligence Technology in Photography and Future Challenges and Reflections,” *The Frontiers of Society, Science and Technology* 6, no. 6 (2024): 26. <https://doi.org/10.25236/FSST.2024.060605>.

Photographers Using AI

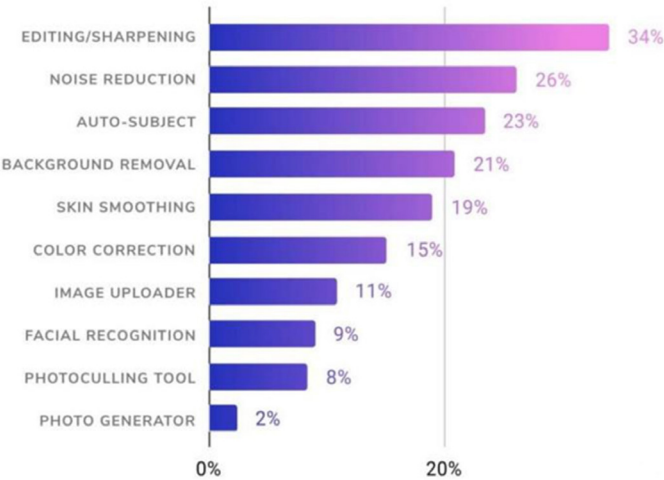


Figure 10: Zenfolio 2023 State of the Photography Industry Report. Jaron Schneider, “State of Photography: Business Isn’t Great and Use of AI Is Going Up,” April 20, 2023, PetaPixel, <https://petapixel.com/2023/04/20/2023-state-of-photography-business-isnt-great-and-use-of-ai-is-going-up/>.

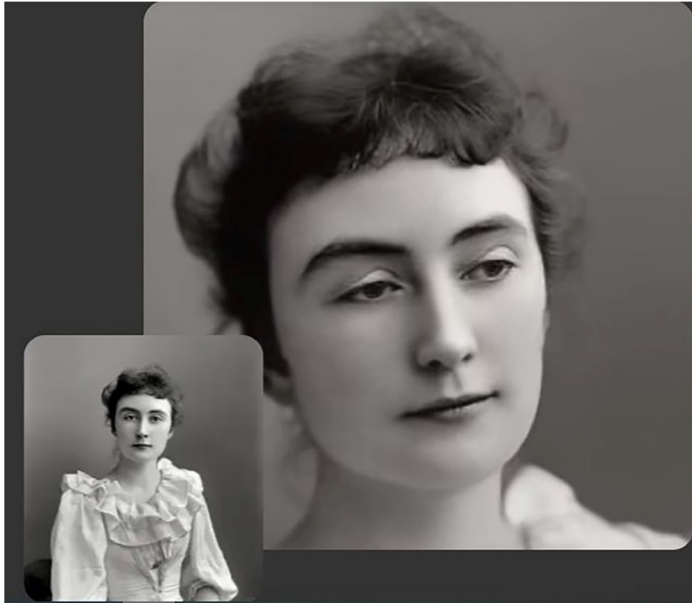


Figure 11: Photography animated by GANs, in Jeremy Gray, “Deep Nostalgia’ AI Tech Animates Old Photos and Brings Them to Life,” March 1, 2021, Digital Photography Review, <https://www.dpreview.com/news/4889126219/deep-nostalgia-ai-tech-animates-old-photos-and-brings-them-to-life>.

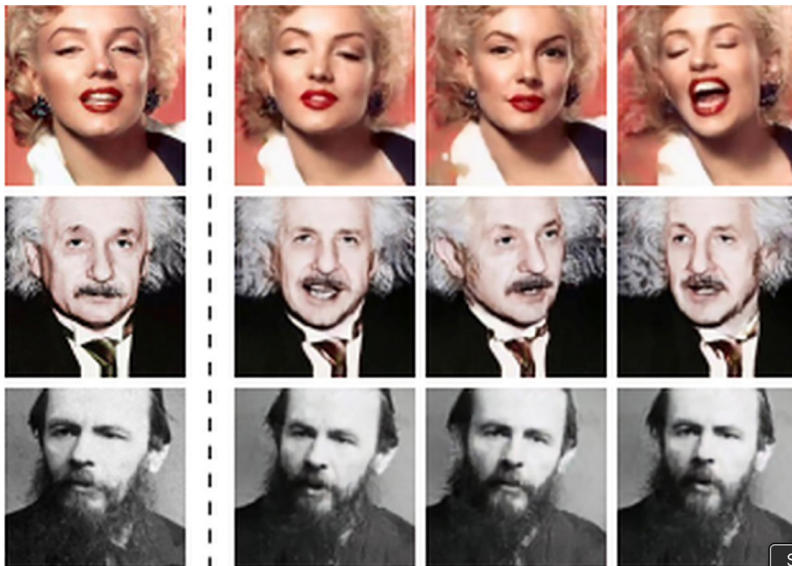


Figure 12: Photographs of famous people re-animated by GANs, in Egor Zakharov, Aliaksandra Shysheya, Egor Burkov, and Victor Lempitsky, “Few-Shot Adversarial Learning of Realistic Neural Talking Head Models. [Paper presentation],” *Proceedings of IEEE/CVF International Conference on Computer Vision (ICCV)*, Seoul, South Korea, 2019, 9459–68, <https://doi.org/10.1109/ICCV.2019.00955>.



Figure 13: Photo was recolored by GANs. kail9974, “[논문 리뷰] HistoGAN: Controlling Colors of GAN-Generated and Real Images via Color Histograms (CVPR 2021),” August 31, 2021, Chill, <https://re-chill.tistory.com/entry/HistoGAN>.



Figure 14: Black and white photograph. This interesting application is to colorize and restore, <https://www.ijraset.com/research-paper/gan-based-state-of-art-image-colorization>

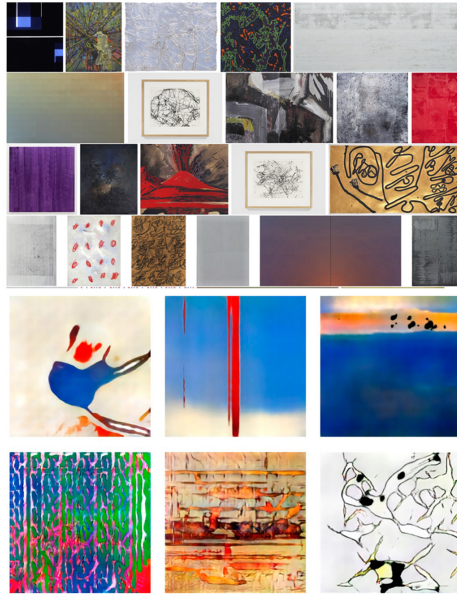


Figure 15: Examples of images generated by AICAN after training using images of all styles and genres from the past five hundred years of Western art. Marian Mazzone, and Ahmed Elgammalm, “Art, Creativity, and the Potential of Artificial Intelligence,” *Arts* 8, no. 26 (2019): 1–9, <https://doi.org/10.3390/arts8010026>.

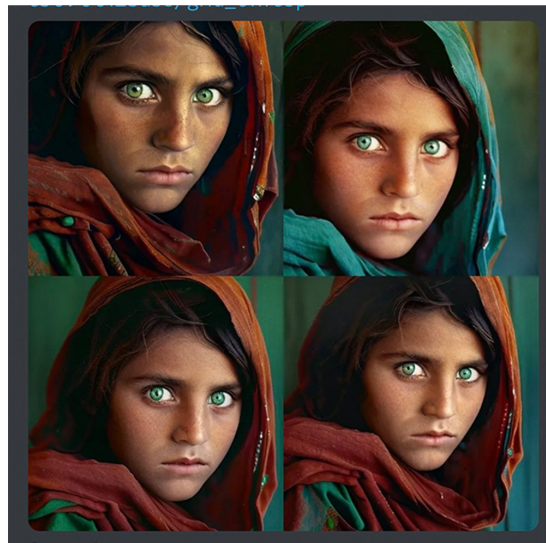


Figure 16: Recreating the image of the Afghan girl using artificial intelligence. (Twitter/Midjourney Discord).

References

- Adorama. “The Impact of AI-Generated Art on Photography & Creative Pursuits | Master Your Craft.” 2022. YouTube. <https://www.youtube.com/watch?v=h0yKcyWHf1I&t=17s>.
- Ballester, Omar. “An Artificial Intelligence Definition and Classification Framework for Public Sector Applications.” In *DG.O2021: The 22nd Annual International Conference on Digital Government Research*, 67–75. Association for Computing Machinery, 2021. <https://doi.org/10.1145/3463677.3463709>.
- Bhattacharjee, Govind. “Art and Photography in the Age of Artificial Intelligence.” In *12th International Photographic Conference of PAD*. Kolkata, 2023.
- CBS News. “AI ‘Nudify’: The Impact, Law Changes, and the Fight.” Last modified December 24, 2023. Accessed January 3, 2025. <https://www.cbsnews.com/news/ai-nudify-impacts-law-change-fight-60-minutes/>.
- Chen, Yongcai. “Artificial Intelligence Technology in Photography and Future Challenges and Reflections.” *The Frontiers of Society, Science and Technology* 6, no. 6 (2024): 24–30. <https://doi.org/10.25236/FSST.2024.060605>.
- Elgammal, Ahmed, Bingchen Liu, Mohamed Elhoseiny, and Marian Mazzone. “CAN: Creative Adversarial Networks, Generating ‘Art’ by Learning About Styles and Deviating from Style Norms.” In *Proceedings of ICCV*, Atlanta, 2017. <https://doi.org/10.48550/arXiv.1706.07068>.
- Gatys, Leon A., Alexander S. Ecker, and Matthias Bethge. “A Neural Algorithm of Artistic Style.” *Journal of Vision*, 16, no. 12 (2016): 1–16. <https://doi.org/10.48550/arXiv.1508.06576>.
- Glynn, Paul. “Sony World Photography Award 2023: Winner Refuses Award After Revealing AI Creation.” BBC News. April 18, 2023. <https://www.bbc.com/news/entertainment-arts-65296763>.
- Gray, Jeremy. “‘Deep Nostalgia’ AI Tech Animates Old Photos and Brings Them to Life.” March 1, 2021. Digital Photography Review. <https://www.dpreview.com/news/4889126219/deep-nostalgia-ai-tech-animates-old-photos-and-brings-them-to-life>.
- Grimsley, Reese. “Edge AI: Real-Time Face Detection and Recognition.” Texas Instruments, 2023. Accessed April 6, 2025, <https://www.ti.com/lit/wp/sprad74/sprad74.pdf>.
- Gülaçtı, İsmail Erım, and Mehmet Emin Kahraman. “The Impact of Artificial Intelligence on Photography and Painting in the Post-Truth Era and the Issues of Creativity and Authorship.” *Medeniyet Sanat – İMÜ Sanat Tasarım ve Mimarlık Fakültesi Dergisi* 7, no. 2 (2021): 243–70. <https://doi.org/10.46641/medeniyetsanat.994950>.
- Hays, James, and Alexei Efros. “Scene Completion Using Millions of Photographs.” *Computer Graphics Proceedings*, Annual Conference Series, 2007, 1–9.
- kail9974. “[논문 리뷰] HistoGAN: Controlling Colors of GAN-Generated and Real Images via Color Histograms (CVPR 2021).” August 31, 2021. Chill. <https://re-chill.tistory.com/entry/HistoGAN>.
- Kili. “Programming Image Classification with Machine Learning: Why and How?” Accessed April 6, 2025. <https://kili-technology.com/data-labeling/computer-vision/image-annotation/programming-image-classification-with-machine-learning>.
- Lister, Martin. “Photography in the Age of the Electronic Image.” In *Photography: A Critical Introduction*, edited Liz Wells, 313–400. John Libbey and Co Ltd., 2006.
- Mazzone, Marian, and Ahmed Elgammal. “Art, Creativity, and the Potential of Artificial Intelligence.” *Arts* 8, no. 26 (2019): 1–9. <https://doi.org/10.3390/arts8010026>.

- Nicholson, Chris V. “A Beginner’s Guide to Generative Adversarial Networks (GANs).” Pathmind, 2020. <https://wiki.pathmind.com/generative-adversarial-network-gan>
- Ozen, Emre, Fikret Alim, Sefa Burak Okcu, Enes Kavakli, and Cevahir Cigla. “Real-Time Face Recognition System at the Edge.” In *Signal Processing, Sensor/Information Fusion, and Target Recognition XXXIII*, edited by Ivan Kadar, Erik P. Blasch, Lynne L. Grewe, Proc. of SPIE Vol. 13057, 2024. <https://doi.org/10.1117/12.3013671>.
- Russon, Mary-Ann. “Google DeepDream robot: 10 Weirdest Images Produced by AI ‘Inceptionism’ and Users Online.” *International Business Times*. July 6, 2015. <https://www.ibtimes.co.uk/google-deepdream-robot-10-weirdest-images-produced-by-ai-inceptionism-users-online-1509518>.
- Schneider, Jaron. “State of Photography: Business Isn’t Great and Use of AI Is Going Up.” April 20, 2023. PetaPixel. <https://petapixel.com/2023/04/20/2023-state-of-photography-business-isnt-great-and-use-of-ai-is-going-up/>.
- Stiegler, Bernard. *Nanjing Lectures: Reading Marx and Engels in the Human Record–From “The German Ideology” to “Dialectics of Nature”*. Translated by Zhang Fugong. Nanjing University Press, 2019.
- Tang, Zeyu. “The Transformation of Photography by Artificial Intelligence Generative AI Technology.” *Journal of Artificial Intelligence Practice* 6 (2023): 57–62. <https://doi.org/10.23977/jaip.2023.060809>.
- Wei, Lei. “Legal Risk and Criminal Imputation of Weak Artificial Intelligence.” In *IOP Conference Series: Materials Science and Engineering* 490, no. 6 (2019): 062085. <https://doi.org/10.1088/1757-899X/490/6/062085>.
- Yi, Ran, Yong-Jin Liu, Yu-Kun Lai, and Paul L. Rosin. “Generating Artistic Portrait Drawings from Face Photos with Hierarchical GANs.” In *Proceedings of IEEE Conference on Computer Vision and Pattern Recognition (CVPR ‘19)*, 10735–10744. Long Beach, CA, USA, 2019. DOI: 10.1109/CVPR.2019.01100
- Zakharov, Egor, Aliaksandra Shysheya, Egor Burkov, and Victor Lempitsky. “Few-Shot Adversarial Learning of Realistic Neural Talking Head Models. [Paper presentation].” *Proceedings of IEEE/CVF International Conference on Computer Vision (ICCV)*. Seoul, South Korea, 2019, 9459–68. <https://doi.org/10.1109/ICCV.2019.00955>.
- Zhang, Kai, Wangmeng Zuo, Yunjin Chen, Deyu Meng, and Lei Zhang. “Beyond a Gaussian Denoiser: Residual Learning of Deep CNN for Image Denoising.” *IEEE Transactions on Image Processing* 26, no. 7 (2017): 3142–55. <https://doi.org/10.1109/TIP.2017.2662206>.
- Zhang, Michael. “Henri Cartier-Bresson on ‘The Decisive Moment’” Peta Pixel. March 12, 2020. <https://petapixel.com/2012/03/20/henri-cartier-bresson-on-the-decisive-moment/>.
- Zhu, Jun-Yan, Taesung Park, Phillip Isola, and Alexei A. Efros, “Unpaired Image-to-Image Translation Using Cycle-Consistent Adversarial Networks. [Paper presentation].” *Proceedings of 2017 IEEE International Conference on Computer Vision (ICCV)*, Venice, Italy, 2017, 2242–51. <https://doi.org/10.1109/ICCV.2017.244>.

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