2025, VOL 15, NO 4, 2361-2382
DOI: 10.48146/odusobiad.1581248
Received Date: 07.11.2024
Acceptence Date: 05.11.2025

Review Article *Open Access*

Use of artificial intelligence-supported image production technologies in art and design

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ABSTRACT

The effects of artificial intelligence-supported image production technologies are spreading to various areas of today's society, leading to significant transformations in many dimensions of life. The use of these technologies in areas where creativity is at the forefront, such as art and design, has a profound impact not only on aesthetic production but also on production processes, tools, and methods. For artists and designers, awareness of the tools and technologies used is a critical factor that directly affects the outcome of the production process. The adoption of artificial intelligence-based production methods pushes the boundaries of traditional production methods, thereby redefining creative decision-making processes. In this context, the research examines the interaction between artificial intelligence and humans from a historical perspective, explaining how these technologies have evolved to the present day and the relationship between humans and artificial intelligence. In the first part, the research provides a brief overview of the history of artificial intelligence, explaining the general relationship between artificial intelligence and humans and its evolution to the present day. In the second part, the primary artificial intelligence-supported image production methods and working principles are examined. In the third section, current works from the field of art and design created today using generative artificial intelligence are examined. In the conclusion, generative artificial intelligence-supported production methods, outputs, and the impact of the process on art/design are discussed. The research is a qualitative study that aims to increase the manufacturer's awareness of the artificial intelligence-supported production process and, at the same time, raise questions about the positive/negative effects of the subject on the relevant fields.

KEYWORDS

Artificial intelligence, generative artificial intelligence, art, graphic design.

Introduction

Throughout history, art and design disciplines have benefited from various techniques and technologies. The images produced through numerous different methods have diversified and accelerated significantly with the development of computer technologies. With the inclusion of artificial intelligence in this equation, the process of image generation has advanced substantially in both qualitative and quantitative terms. Edward Fredkin, one of the directors of the MIT Laboratory for Computer Science, described this transformation as follows: “There are three great events in history. The first is the creation of the universe. The second is the beginning of life. The third, which is equally important as the first two, is the emergence of artificial intelligence” (Franchi & Güzeldere, 2005, p.1).

Artificial intelligence currently has numerous applications in various areas that significantly impact our daily lives, including digital assistant services, search engines, social media, marketing, healthcare, production planning, security, e-commerce, and financial services. While its use in positive and data-driven sciences is interpreted as the development of tools that facilitate everyday life, its application in art and design fields that rely on originality and creativity has sparked certain debates. An artist’s or designer’s competence in mastering the tool they

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employ for image production plays a vital role in creating original works. In this context, it is crucial for those who utilize AI-based technologies in art and design to comprehend the working principles of these algorithms, to identify the dynamics that influence visual generation, and to manage the process effectively to achieve the desired outcome.

Accordingly, this study traces the transformation of AI-assisted image-generation methods from their early development to the present day, focusing on their use as a component within art and design. It summarizes, through key milestones, the brief historical trajectory of human–AI interaction since the 1950s. The study aims to explain the operating principles of dominant image-generation approaches, highlighting their strengths and weaknesses, and to analyze selected examples from contemporary art and design practices within a methodological framework, thereby making the relationship between the production process and output visible. By discussing, considering the findings, the effects of generative artificial intelligence on creative processes, originality, intellectual property, and ethical and social issues, the study aims to provide a conceptual and practical roadmap that can enhance practitioners' awareness of the creative process.

Method

This study employed a qualitative research approach to investigate the historical development, technical principles, and contemporary applications of AI-assisted image-generation methods in art and design. The research began with an extensive literature review. Academic articles, books, conference proceedings, and technical reports on the application of artificial intelligence in the context of art and design were reviewed, and significant technological milestones that have shaped human–AI interaction were identified. Information was collected on the emergence, operational principles, and application areas of the principal image-generation technologies—such as GAN, AICAN, CNN, VAE, Transformer, and diffusion models. Selected artworks produced using AI in the fields of contemporary art and design were examined. In these case studies, artist statements, technical details, algorithms employed, visual outcomes, and their aesthetic and conceptual positions were evaluated. All collected data were analyzed thematically. The findings were discussed under the following themes: historical development, technical mechanisms, production process–output relationships, levels of creativity and originality, debates on intellectual property, and social implications.

One of the significant contributions of this research lies in highlighting notable examples of collaboration between art and artificial intelligence within design practice. The case studies analyzed in the paper provide a concrete framework for artists and designers from different disciplines to understand how AI-based creative processes are structured. This framework reveals not only the technical aspects of the technologies used but also how the artist participates in the creative process, how decision-making mechanisms evolve, and how human–machine interaction manifests in aesthetic outcomes. Thus, the study serves as a guiding reference for professionals in the field to evaluate their own practices and to develop new projects.

A brief history of artificial intelligence

The concept describing computers' ability to possess human-like intelligence was first defined in its modern sense by John McCarthy in 1956. Although the origins of artificial intelligence date back to the early twentieth century, its development has undergone several crucial stages before reaching its current state. The Turing Test, developed by Alan Turing—the pioneer of modern computer science—is considered one of the first significant initiatives in this field. Devised in 1950 and known as "The Imitation Game," the test defined a process in which a machine attempts to convince a human that it, too, is human. Although initially regarded as a simple experiment, this test is recognized as having paved the way for early AI research. Turing's work inspired his contemporaries to develop software that would eventually shape the field of artificial intelligence (Nilsson, 2019).

The most significant advancement following Turing's contribution was the emergence of Expert Systems in the late 1960s. These systems were designed to make human-like decisions within specific domains of expertise and were applied in areas such as medicine, engineering, and finance. With advances in technology, the use of updated expert systems reached a new level by the late 1980s. The growing need to convert complex data into logical information led to their adoption across many industries. By the end of this period, during which language and image-processing techniques developed rapidly, artificial intelligence entered what became known as the "AI Winter." Borrowed from the term "nuclear winter," this concept described a stagnation period in AI research caused by reduced funding, excessive project complexity, and unmet expectations from expert systems, which together halted progress in the field (Marina, 2022).

In the 1990s, artificial intelligence research experienced a resurgence in momentum, driven by economic successes and promising returns on investment. A significant milestone of this era was IBM's computer *Deep Blue*, which could calculate 200 million possible moves per second. When it defeated world chess champion Garry Kasparov, public and academic interest in AI increased dramatically. Entering the twenty-first century, the rise in computing power, advances in data-mining technologies, big data analytics, machine learning, and deep learning algorithms were identified as the core factors driving the rapid and profound progress of artificial intelligence (Christian & Griffiths, 2017).

This historical evolution of AI has sparked debates about the position of the intellectual act, long regarded as the irreplaceable and unique foundation of art and design. While the integration of algorithmic learning and generative capacity into the conceptual and aesthetic decisions at the heart of creativity is sometimes viewed as a means of enhancing efficiency and diversity in production, it also raises concerns that the human mind's unique contribution may be overshadowed, prompting questions about the "creative" nature of the artwork itself. Consequently, the collaboration between humans and machines in artistic production invites a reconsideration of the distribution of roles, the boundaries of intellectual labor, and the definition of creative authority, providing a rich ground for both positive and critical discussions.

AI-based image generation technologies and operating principles

GAN (Generative adversarial networks)

The year 2014 can be regarded as a turning point in AI-based image-generation technologies. At only 28 years old, American computer scientist Ian Goodfellow made history as the inventor of the first deep-learning model capable of generating images—*Generative Adversarial Networks* (GANs). Developed and introduced by Goodfellow and his team, this technology has played a pivotal role in solving various problems such as image synthesis and correction, face and character generation, text creation, style transfer, data augmentation, image enhancement and restoration, video production, sound synthesis, object recognition, and data control (Gülaçtı İ. E. & Kahraman M. E., 2021, pp. 245–247). Numerous GAN models have been developed for different purposes, including cGAN, DCGAN, InfoGAN, SGAN, ACGAN, WGAN-GP, and LSGAN.

The conventional GAN model differs from classical deep neural network architecture (Figure 1). To perform adversarial learning, the algorithm must contain two distinct neural networks—a *generator* (G) and a *discriminator* (D). The discriminator network attempts to distinguish between synthetic (fake) images and real ones in the dataset. In contrast, the generator network produces new images from a noise input, aiming to imitate authentic images and closely deceive the discriminator. Both networks are competitively and in parallel trained. After a certain number of training iterations, the generator begins to produce images that strongly resemble real ones (Çelik & Talu, 2020).

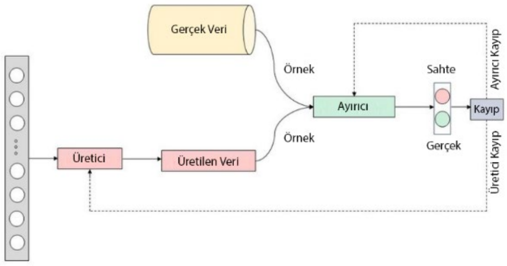

Figure 1 Operational Diagram of Generative Adversarial Networks (GAN). (https://www.researchgate.net/publication/344067228)

With the advancement of GAN technology, its use in the field of art has also become increasingly evident. The first artwork recognized as being produced by artificial intelligence is considered to be *Portrait of Edmond de Belamy*, which was sold at Christie's auction house in 2018 (Figure 2). Created using GAN technology, the piece was widely regarded at the time as resembling artworks produced through traditional methods. Produced by the French art collective *Obvious*, the work was generated by training the algorithm on a dataset of portraits. This piece is recognized as one of the pioneering examples that demonstrate artificial intelligence's ability to imitate artistic production (Edmond de Belamy, 2024).

Figure 2 *Portrait of Edmond de Belamy*, produced by the Obvious Collective, 2018. (https://en.wikipedia.org/wiki/Edmond_de_Belamy#/media/File:Edmond_de_Belamy.png)

AICAN (Artificial intelligence creative adversarial network)

Another significant advancement in AI-based image generation is the development of AICAN technology. The name *AICAN* is an acronym formed from the initials of *Artificial Intelligence Creative Adversarial Network*. Developed by the Art and Artificial Intelligence Laboratory at Rutgers University, AICAN is an autonomous artificial intelligence model capable of learning existing artistic styles and aesthetic tendencies to create its own innovative images and produce art independently. The laboratory's main objective is to explore how the evolution of the artistic creation process is shaped by the interplay of perceptual and cognitive perspectives in art. In this process, image creation continues through stages in which artists deviate from traditional concepts and styles to develop new ones (Elgammal & Mazzone, 2021, p. 315).

The model employed in this creative process is based on Colin Martindale's psychological theory and functions through a *Creative Adversarial Network (CAN)*—a variant of the *Generative Adversarial Network (GAN)* that adopts the principle of "formal absolutism." The machine is trained between two opposing forces: one directing it to imitate established styles (maximizing style) and the other compelling it to monitor the aesthetic value of the generated artwork (minimizing deviation from the distribution of artistic imagery) (Figure 3). This approach aims to ensure that the generated artwork remains innovative while adhering to aesthetic standards. Martindale's "least effort" principle is positioned as the fundamental guideline of this artistic production process (Elgammal, Liu, Elhoseiny, & Mazzone, 2017).

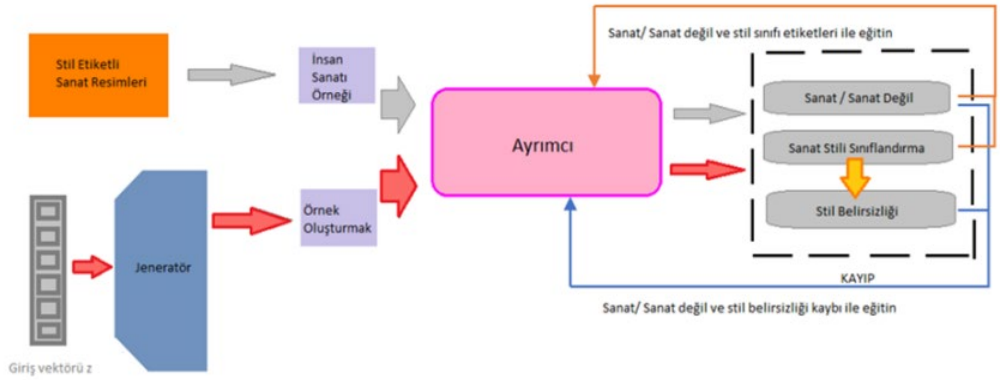

Figure 3 Operational diagram of the creative adversarial network (CAN) created by Ahmed Elgammal, 2019. (https://dergipark.org.tr/tr/download/article-file/2030537)

The paintings in (Figure 4a) were used in an experiment investigating whether images produced by the AICAN algorithm could be distinguished from artworks created by human artists. A Turing test designed by the Rutgers Artificial Intelligence Laboratory was administered to participants. In the test, images generated by the AICAN algorithm—trained on over 80,000 examples from classical Western art—were mixed with artworks created by human artists for an exhibition at Art Basel in 2016 and then presented to the participants. The majority of participants were unable to differentiate between the two groups clearly. Moreover, 75% of the participants stated that they believed the images produced by AICAN had been created by human artists.

In another experiment, participants were shown images generated in the style of abstract expressionism. In this case, 85% of the participants reported that they thought the images created by AICAN had been painted by human artists (Deveci, 2022, pp. 55–56).

Defining itself as a model capable of autonomous creation without human intervention, drawing upon art-historical knowledge and theories developed by the human brain regarding aesthetic perception—AICAN continues to produce and exhibit artworks. In 2019, during the exhibition titled *Faceless Portraits Transcending Time* (Figure 4b), AICAN, trained on more than 100,000 works in the Western artistic tradition, generated new artworks that blended the aesthetics of contemporary art with the historical evolution of aesthetic understanding. Without any direct collaboration with a human artist, AICAN independently determined the style, subject, composition, color, and texture of its artworks (AICAN, 2024).

Figure 4a Images presented to participants during the Art Basel experiment, 2016. (https://www.interaliamag.org/articles/ahmed-elgammal/)

Figure 4b Visuals produced by AICAN from the exhibition Faceless Portraits Transcending Time, AICAN & Ahmed Elgammal, 2019. (https://www.aican.io/)

CNN (Convolutional neural network)

Another important technology frequently utilized in AI-based image generation methods is the *Convolutional Neural Network (CNN)*. Recognized as a subfield of deep learning, CNNs have demonstrated remarkable success in visual analysis and image generation. In this deep learning algorithm, where images are used as input data, the network performs classification by identifying and distinguishing the features of the images.

Compared to other algorithms, the CNN process enables the preliminary data required for managing the system to be processed more efficiently. This advantage stems from the network's ability to learn through filters that perceive visual information. The software architecture of CNN consists of three main components: the Convolutional Layer, the Pooling Layer, and the Fully Connected Layer (Raghav, 2024) (Figure 5).

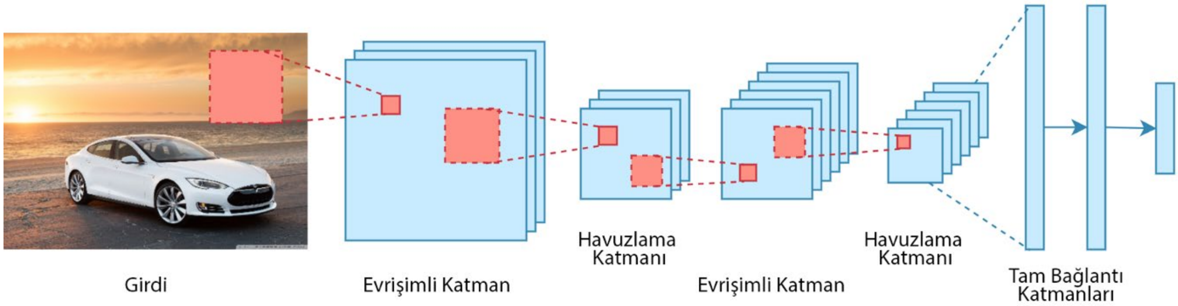

Figure 5 Flowchart of the convolutional neural network (CNN). (https://nitin-panwar.github.)

The first stage, known as the Convolutional Layer, is the initial step in which operations are performed on the image within this algorithm. As its name suggests, this layer embodies the defining feature of the technique and structure itself. Numerically, an image is represented as a matrix containing various values. In this layer, the process involves filter matrices—smaller than the image matrices—moving across the image and collecting data from localized regions.

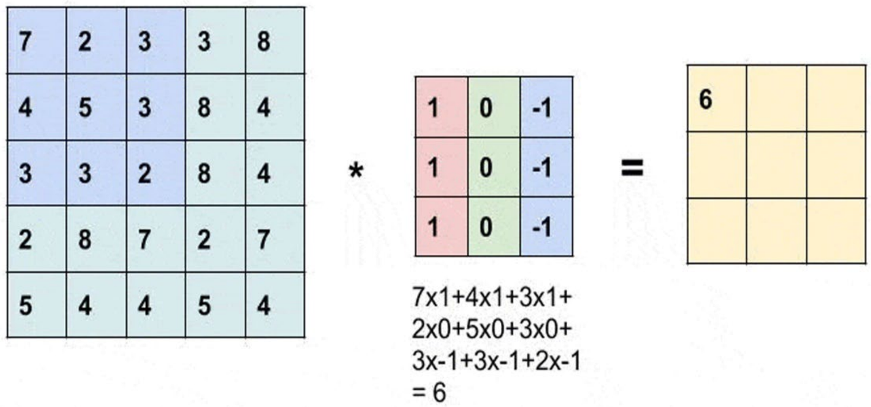

Figure 6a Example of an image matrix. (https://medium.com/deep-learning-from-deepest)

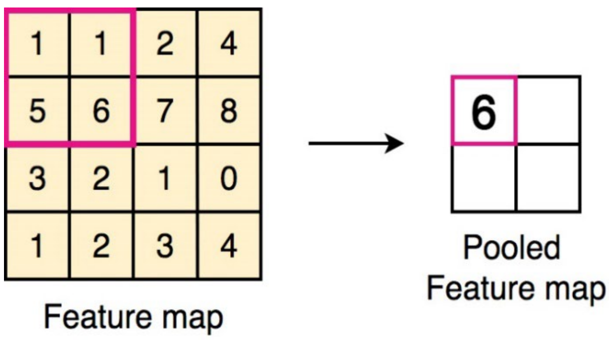

Figure 6b Operating principle of the pooling layer. (https://medium.com/deep-learning-from-deepest)

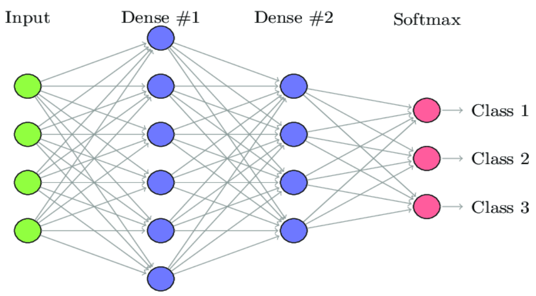

Figure 6c Operating principle of the fully connected layer. (https://medium.com/deep-learning-from-deepest)

In the example image (Figure 6a), the process is summarized. A 3×3 filter matrix moves across a 5×5 matrix, scanning its rows and columns to collect data. During this movement, the corresponding indices are multiplied and summed, and the resulting value is recorded as the first element of the output matrix. This process continues across the entire surface of the 5×5 matrix, forming the output matrix. Through these calculations, the algorithm identifies the features present within the image.

In CNN algorithms, the values computed by the filters are used as data that the model continually updates and learns from. The second stage is the Pooling Layer. Positioned between multiple convolutional layers in the CNN architecture, the pooling layer aims to preserve essential information obtained in the initial step while reducing the number of parameters and the spatial dimensions, effectively downscaling the image (Figure 6b).

The final layer in image generation within Convolutional Neural Networks is called the Fully Connected Layer (Figure 6c). In this layer, the data matrices that have passed through multiple convolutional and pooling layers are flattened into a single vector and connected or transmitted to the next layer (Raghav, 2024).

Launched in 2015, the DeepDream project is considered a pioneering example of using convolutional neural networks in image generation. DeepDream is a computer program developed by Google engineer Alexander Mordvintsev. The program employs a convolutional neural network to detect patterns and enhance images, adopting a method known as *algorithmic pareidolia*—the human tendency to perceive familiar patterns or meanings in random stimuli. Through over-processed imagery, the software generates dream-like, hallucinogenic visuals.

Google's DeepDream program defines the term *"deep dreaming"* as the generation of images that produce desired activations within a deep neural network. The term also refers to the collection of corresponding visual forms. The DeepDream software, created in the format of a convolutional neural network, was inspired by the film *Inception*. Although it developed in 2014, it was officially released in July 2015. The idea behind DeepDream traces back to the early days of neural networks, when similar visualization techniques had already been used by various research groups (Portilla, 2000).

Google later published its technical methods and released the code as open source. This move enabled users to transform their own images using a variety of tools, including mobile applications, web services, and desktop software. Initially designed to classify images autonomously, the program can achieve the desired outcome by running the network in reverse once trained (Figure 7). In this way, an original image can be re-adjusted to yield a higher confidence score for a specific output neuron, for example, faces or particular animals. This technique is used to tune the structure of the neural network and constitutes the fundamental operating principle of DeepDream (DeepDream, 2024).

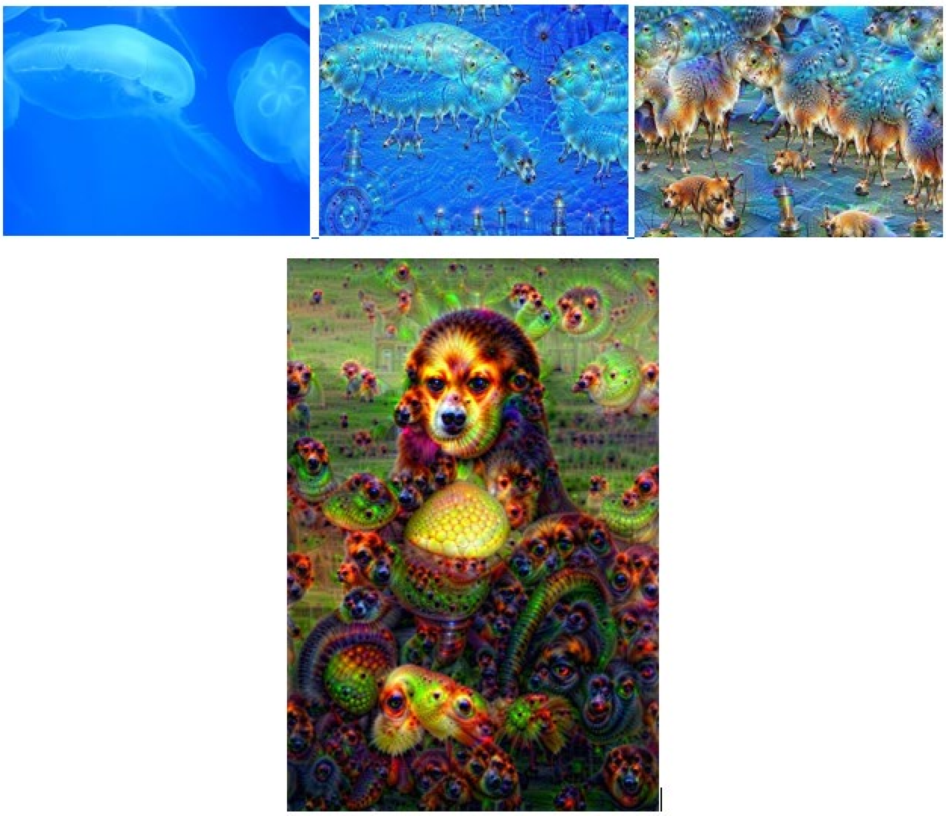

Figure 7 Images from the *DeepDream* Project. (https://tr.wikipedia.org/wiki/DeepDream)

VAE (Variational autoencoder)

In AI-assisted visual generation, producing different variations of the same type of data is a significant issue and challenge. The model used to address this problem is the Variational Autoencoder (VAE). The VAE architecture emerged from the training and enhancement of the Autoencoder (AE) model—an architecture designed to compress and reconstruct large amounts of data with minimal loss—through the application of generative artificial intelligence (Vahdat, 2020, p. 6).

The laboratory's main objective is to explore how the evolution of the artistic creation process is shaped by the interplay of perceptual and cognitive perspectives in art. In this process, image creation continues through stages in which artists deviate from traditional concepts and styles to develop new ones (Figure 8). Data obtained from the massive MNIST database, which consists of images of handwritten digits (MNIST, 2024), were used to train the VAE system. By assigning specific meanings to the different parts of the digits in these images, the code generated by the VAE is guided to perform logical classification and generation tasks. A similar mechanism is also applied to a VAE trained on human face data, enabling it to generate new facial variations that do not exist in the original training dataset (Kingma & Welling, 2014).

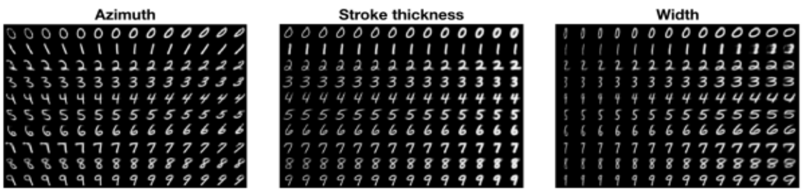

Figure 8 Images generated by the variational autoencoder (VAE). (https://arxiv.org/pdf/2007.03898)

Transformer

The article *"Attention Is All You Need,"* published in 2017, marked a significant milestone for artificial intelligence models used in both language and visual domains. Jointly developed by Google Brain, Google Research, and the University of Toronto, this paper introduced a model called the Transformer. In brief, a transformer model is a neural network capable of learning the meaning of a sentence by tracking and comparing the sequential dependencies among words (Vaswani, 2017).

The most distinctive feature of this model is its ability to interpret subtle relationships between distant words in significant texts through a series of mathematical operations known as *attention* or *self-attention*. Transformers, which form the foundation of language models such as GPT and BERT, are also employed in the algorithms behind search engines like Google and Bing. Beyond text classification and large-scale data generation in advanced NLP tasks, transformer architectures are also applied in biological and medical domains—such as interpreting long DNA sequences, understanding amino acid structures in proteins, and assisting in drug design (Nvidia, 2024).

Since 2020, this model has also been used for visual data processing and generation under the name Vision Transformers (ViT). Tested on ImageNet, a web-based dataset containing over 14 million images designed to measure the visual recognition performance of AI models, ViT achieved remarkable success. The system divides images into small segments called *patches*, similar to how words are treated in a sentence. It compares them with other data while autonomously interpreting the relationships among these patches (Figure 9). Through this mechanism, the model can establish long-range connections between different regions of an image sequence, processing trillions of images circulating on the internet and making them usable (Chen, 2021).

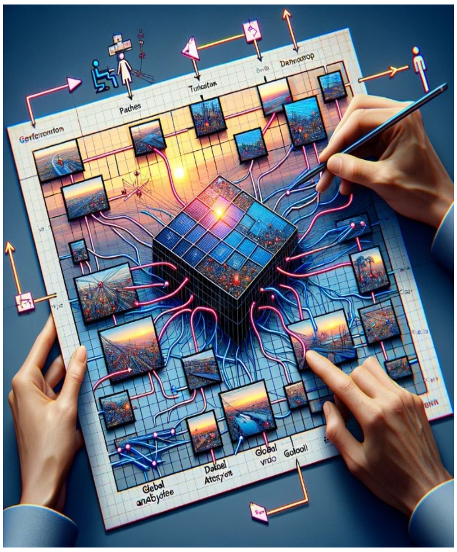

Figure 9 An illustration summarizing the vision transformer (vit) process. (https://visionplatform.ai/vision-transformers-vit)

Diffusion

With the advancement of technology, the artificial intelligence algorithms used in image generation have continued to evolve. The diffusion model, which interprets the relationship between pixel distribution and noise (random pixels) through a different approach, has become one of the most widely used methods in today's image-generation models.

The diffusion technique operates by reversing the process by which noise is removed from an image that a neural network aims to generate (Figure 10). At each noise-removal step (iteration), the system, trained with the support of text prompts, seeks to reconstruct an image that most closely aligns with the given textual data when the diffusion process is reversed (Chang, 2023).

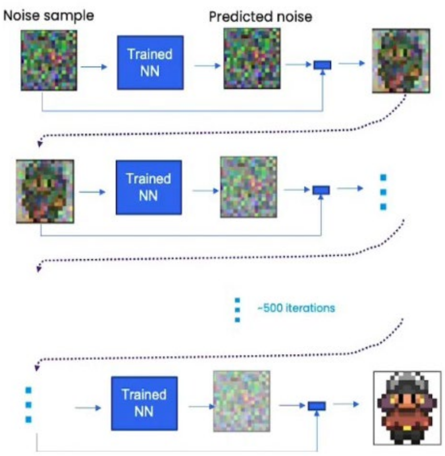

Figure 10 Image Generation Process Using the Diffusion Method. (https://cbarkinozer.medium.com/dif%C3%BCzyon-modelleri)

It has been observed that Generative Adversarial Networks (GANs)—once considered among the earliest models for visualization—have now largely been replaced by diffusion models. These models have demonstrated outstanding performance in areas such as text-to-image generation, enhancing low-quality or noisy images, color segmentation, and image restoration (Atiker, 2024). They are currently employed by many AI-based image generators, including Stable Diffusion, DALL·E, and Midjourney.

Contemporary applications of generative artificial intelligence in art and design

Traditionally, the creative processes in art and design have been driven by the human brain and emotional intelligence. However, algorithms and intelligent systems developed through artificial intelligence now provide artists and designers with new creative possibilities. Examples of these include image generation, content creation, and the management of form and style.

Using AI and deep learning methods, it is now possible to generate preliminary visuals or concept images that can serve as sources of ideas and inspiration in the design process. For instance, an AI model can analyze artworks contained in datasets and learn their style, color palette, form, and content. As a result, it can produce new, alternative creations that reflect these characteristics. Trained AI models can also provide users with personalized design suggestions and assist them in making informed design-related decisions.

Moreover, AI is actively employed in creating interactive artistic experiences. With the capabilities these technologies provide, it is possible to develop digital installations that can sense users' movements or voices and respond interactively. Beyond image generation, AI technologies are also utilized in various other fields, including digital restoration of artworks, content analysis, art-historical research, and the analysis of art market trends (Li, 2020; Yang, 2020).

An example of AI use in painting can be seen in Alexander Reben's project titled *"Speak Art Into Life."* The academic artist, affiliated with institutions such as the MIT Media Lab, UC Berkeley, the School of the Museum of Fine Arts (SMFA), and the Commonwealth Charter Academy (CCA), introduced this project during his TED Talk held in Vancouver, BC, in 2023. The project aims to establish an AI-assisted bridge between the viewer and the artwork, creating an interactive dialogue that redefines the human–machine relationship in artistic expression. (https://en.wikipedia.org/wiki/Alexander_Reben).

Figure 11 Images from the *Speak Art Into Life* Project, 2023. (https://areben.com/project/speak-art-into-life)

The artwork begins to take shape when the viewer speaks into a microphone positioned in front of a projected display on the wall (Figure 11). The participant describes what they imagine and specifies which concepts they want to appear or be excluded from the work. Once the viewer completes this verbal and conceptual description, the artificial intelligence system generates four different visual outcomes based on the given input. The viewer then selects one of these options, finalizing the creative process. The work aims to reference concepts such as *artificial philosophy*, *synthetic psychology*, and *perceptual manipulation*. Viewing art as an experiment, the artist integrates generative language and image models, inviting the viewer into the production process to question the "human–machine relationship" that forms the core of his inquiry.

The setup depicted in Figure 11 transforms a voice-triggered *ekphrasis* flow into an experimental design problem: the verbal descriptions spoken into the microphone are converted into visual prompts through a custom-written program. The system produces four alternative visuals based on these textual inputs, and the process concludes when the viewer makes a selection (linguistic description → visual proposition → curatorial choice). This selection does not result in a single isolated outcome; instead, each contribution is layered onto previous ones, forming a collective composition that grows like a *linguistic exquisite corpse*, accumulating the "traces" of past participants. The project's first public exhibition took place at TED 2023 Vancouver.

In this respect, the work renders visible the collaboration between generative language and image models by dividing human–machine interaction into the roles of "mediator" (microphone/interface), "generator" (model), and "selector" (viewer). While shifting the viewer's role toward that of performer or curator, it redefines the artwork as an ongoing, community-based entity. Thus, the concepts central to Reben's practice—*artificial philosophy*, *synthetic psychology*, and *perceptual manipulation*—take on concrete form: the participant's linguistic biases are transmitted to the model, the model produces visual hypotheses within its probabilistic space, and human choice reduces these hypotheses to a single output.

This three-stage cycle exposes a key question: *At what point is the aesthetic decision made—during textual construction, visual generation, or final selection?* It repositions authorship and originality along the axis of "single artwork/multiple authors." Ultimately, the piece—where speech is transformed into imagery—demonstrates that user participation in the design of generative systems not only determines the aesthetic outcome but also enables artificial intelligence to accumulate cultural memory through layers of collective interaction (Alexander, 2024; Bitforms, 2023; Crocker Art Museum, 2023).

AI-supported works can also be observed in the field of animation production. One such artist, Vadim Epstein, employs generative neural networks to create moving images. Known for his research in neural information processing systems, computer vision, and pattern recognition, Epstein showcased his work, Turbulence, at the "When All Dreams Come True" event held in Ontario, Canada, in 2023. This piece exemplifies the use of artificial intelligence in animation production. In this international event that brought together numerous works incorporating generative AI into artistic creation, Epstein stated that his work explores ways of achieving original and bold imagery within post-industrial cultures (Vadim, 2024).

Figure 12 Images from *Turbulence*, 2024. (https://www.provocation.ca/ai-art-gallery#VadimEpstein)

Since 2017, Vadim Epstein has developed experimental approaches in AI-based artistic production. In *Turbulence*, the artist constructs not only abstract imagery that offers aesthetic diversity but also a visual language representing the chaotic order and constant motion of nature. By merging images generated through the Stable Diffusion algorithm, Epstein reveals how randomness and repetition can organically form a fluid visual continuity. The process provides the viewer with more than a "video to watch;" through the constantly evolving structure of the image, it creates an experience of perceptual ambiguity and discontinuity.

The visual language of the work, composed of digitally generated abstract forms, evokes the biological movements of living organisms or vortex–like structures found in nature. Epstein's piece also delivers a holistic audiovisual experience, incorporating sound elements that respond dynamically to visual changes. Using AI-supported sound modules such as RAVE and NI Reaktor, the artist produces a soundscape synchronized with the visual dynamics. Thus, the work generates a digital simulation of the chaotic rhythms of life through visual and auditory harmony.

According to the artist, this approach demonstrates that achieving original and bold imagery in post-industrial culture is possible not merely through aesthetic choices but through the embrace of algorithmic processes (Provocation, 2024).

Furthermore, *Turbulence* exemplifies Epstein's central creative strategy of developing "shared archetype–based yet unpredictable" imagery. The sequential fluctuations of images evoke both familiarity and strangeness in the viewer, positioning artificial intelligence as a tool that reconfigures the cultural unconscious. As seen in the version published on Vimeo, the five-minute piece immerses the viewer in a state of continuous transformation, navigating the boundary between digital animation and cinematic experience (Vimeo, 2024).

In this sense, *Turbulence* functions not only as a technical achievement but also as a philosophical prototype, illustrating how human–machine collaboration may transform artistic creation in the future.

AI is also increasingly used in video art and experimental cinema. A notable example is *Floral Zombification Via Attention Node Networks*, directed by Derrick Schultz. The film premiered at the Winnipeg Underground Film Festival and won the "AI-Driven Film" category at the 2023 Chroma Art Film Festival, standing as a prominent case of AI-driven filmmaking (Artificial, 2024).

Figure 13 Images from *Floral Zombification Via Attention Node Networks*, 2023. (https://artificial-images.com/#info /)

The film (Figure 13) visualizes the tension between "blooming" and "decay" through the use of artificial intelligence. Flower, fungus, and skeleton images were generated using Stable Diffusion–based text-to-image models; each scene is constructed as an exaggerated and grotesque interpretation of the natural life cycle. In this sense, *Floral Zombification Via Attention Node Networks* does not merely depict a biological phenomenon but also reveals the "hybrid" reactions that artificial intelligence produces while reconstructing natural forms. The visual contrast between the liveliness of flowers and the rigid, deathly quality of skeletons evokes both fascination and discomfort in the viewer. This duality can be interpreted as a reflection of the “uncanny aesthetics” frequently found in AI-generated works of the post-digital age.

One of the striking aspects of the film is its reference to the “attention node networks” structure, which makes visible the details to which the machine directs its focus. The neural network’s shifting and re-centering of attention parallels the film's fragmented editing. Just as AI continually relocates its focal points, the scenes are linked through abrupt transitions, prompting the viewer to focus not only on the narrative but also on the technique of production itself (Artificial Images, 2024).

Moreover, the film interprets the notion of “zombification” not only as a biological concept but also as a cultural metaphor. The uncontrolled proliferation of organisms parallels the unpredictable pace of growth in contemporary AI technologies, presenting an implicit critique of this trend. Thus, Schultz’s work fuses experimental cinema with contemporary technological anxieties, making generative artificial intelligence both the subject and the medium of creation. This dual positioning clarifies the central idea underlying the film’s visual intensity: human–machine collaboration continuously generates a field of balance and tension between life and death, creation and dissolution.

Today, it is possible to observe a growing diversity and increasing prevalence of AI-assisted production techniques. Examples include corporate identity design, poster design, typeface design, packaging design, web design, illustration, and video production.

In Figure 14a, the AI-based corporate identity tool, Brandity AI, is illustrated. In the traditional workflow—comprising discovery/strategy (stakeholder interviews, brand personality, positioning, competitor analysis), conceptual framework and moodboards, typography–color–iconography selection, logo/sign development with iterative revisions, application samples (business cards, social media, digital/print touchpoints), and finally the production of a corporate identity guide—the model’s consistency depends on the designer’s expertise, while production speed remains limited.

In AI-assisted workflows, however, a short task prompt generates color palettes, font suggestions, logo variations, and complete *brand kit* outputs within minutes, aiming to deliver a coherent visual language skeleton almost instantly. Based on the brand vision input, the tool generates coordinated logo, color, art style, and font suggestions, compiling them into a unified identity package. Furthermore, automatic brand-guideline generators create text-based documentation of typographic hierarchy, usage rules, and tone/style instructions, reducing the designer’s documentation workload.

Artificial intelligence accelerates pre-draft and variation production in branding, while strategic framing, originality control, licensing, and long-term brand architecture remain the primary responsibilities of the human designer. AI-generated outputs carry a risk of homogenization, and human–machine collaboration remains necessary in the final implementation and copyright verification stages.

AI-supported production is also used in poster design (Figure 14b). In traditional processes, the communication goal and target audience must be defined, content hierarchy (headline–subhead–body–call-to-action) established, grid and rhythm determined, typography/color composition designed, and visual materials (photos/illustrations) created before prepress preparation (color separation, format, scale).

In Fotor’s AI Poster workflow, the user provides a textual prompt, and the system generates compositions within seconds using text-to-image infrastructure and template libraries; the user then adjusts typography and visuals. This method reduces the designer’s “blank page” problem and enables rapid variation generation—particularly advantageous for poster series and social/digital adaptations. However, decisions involving typographic contrast, optical alignment, legibility, and print profiles remain critical, as AI-generated layouts risk producing uniform aesthetics.

Figure 14c depicts Process Studio's AIfont initiative, illustrating AI-assisted type design. Traditional typeface design involves the designer creating glyph sets from sketches, adjusting metrics, and performing optical refinements to achieve a refined appearance. The AIfont project, trained with a custom DCGAN on a large dataset of text-containing images, generates square-based shape variations. The project presents 500 static files and a variable font that visualizes form oscillations at different training stages.

This production was extensively utilized in the visual identity of the 2019 Vienna Biennale exhibition, "Uncanny Values: AI & You," testing the translation of machine learning into typographic expression within a public context. AI-based typeface generation offers strong potential for experimentation and variation; however, readability, diacritics, OpenType features, and metric consistency still require the designer's finishing refinements.

In Figure 14d, AI-assisted packaging designs are shown. In traditional workflows, structural design (die-cut and folding templates) is developed in tandem with brand strategy. Material and sustainability assessments are conducted, regulations and labeling requirements are met, shelf/logistics constraints are considered, 3D mock-ups and prototypes are tested, and production readiness is achieved.

Sourceful's "Spring" tool—later integrated under the unified Sourceful brand—accelerates the concept generation, blending, and refinement loop based on user inputs. Expert designers then finalize the process for print production, operating within a human-in-the-loop model. The use of AI in packaging accelerates multi-variant exploration and early visualization; however, compliance with regulations (such as nutritional values and warnings), material/production limitations, and brand management still requires human expertise.

Figure 14e shows an AI-generated web design interface produced by Wix. Instead of the traditional coding process, this system employs a chat-based setup to construct the site structure, page sections, text, and visuals within a short time. AI expedites the initial design phase and supports content generation, while design coherence, accessibility, performance, and brand tone refinement remain under the designer's supervision.

In Figure 14f, images generated with Midjourney, one of the AI illustration tools, are displayed. In traditional illustration workflows, steps include brief analysis, sketching/composition, stylistic decisions, color and texture strategy, and development of the final original drawing. AI-assisted illustration progresses through prompt creation, variation/upscale, and style-mixing cycles, with the user acting almost as a curator within a large pool of outputs guided by the brief.

AI enables rapid concept/style exploration, as well as large-scale variation in illustration; however, issues of originality, copyright, style imitation, and final technical processes—such as vectorization and adaptation—still require human input.

Figure 14g depicts the AI-assisted animation production workflow developed by DeepMotion. In traditional animation, keyframing, forward/backward solving, or studio-level motion capture with markers are commonly used, while rigging, retargeting, and clean-up processes are time-intensive.

In this new workflow, markerless 3D motion capture can be extracted from uploaded videos to produce skeletal animations. This approach significantly reduces the workload required to initiate a project and can be applied either in real-time from videos or as a hybrid text-to-video/2D-to-3D process.

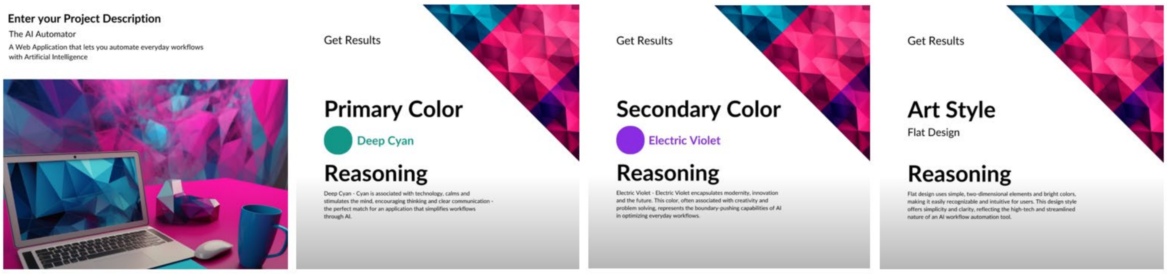

Figure 14a AI-Assisted corporate identity production process using *Brandity AI* by Kodora, 2024. (https://kodora.ai/ai-tool/brandity-ai)

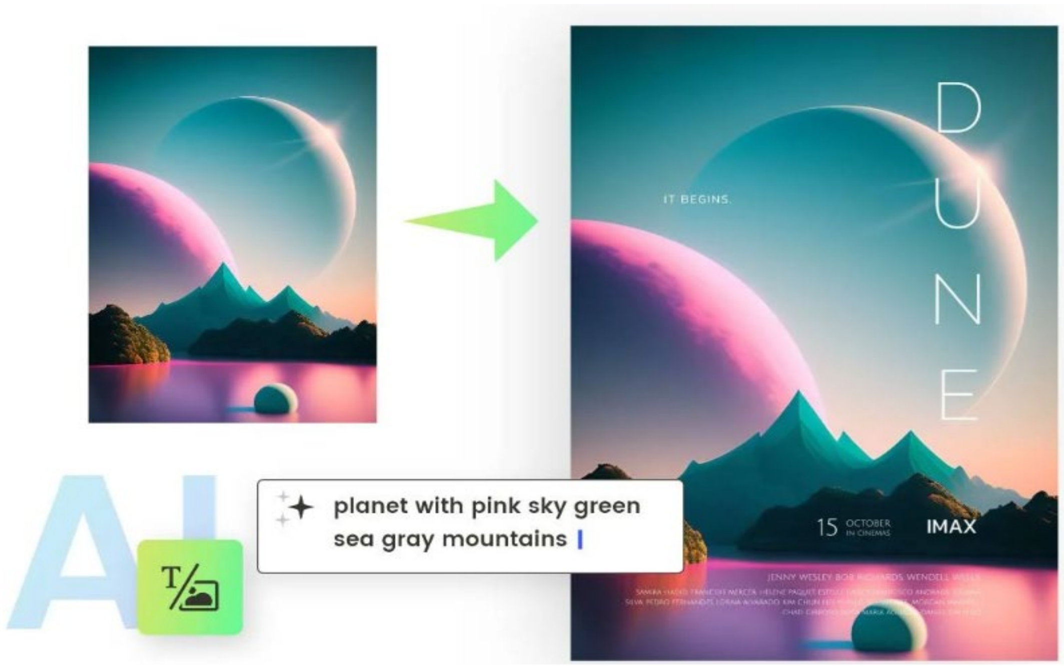

Figure 14b AI-Assisted poster design production process using the online platform *Fotor*, 2024. (https://www.fotor.com/features/ai-poster)

Figure 14c Typeface designed with artificial intelligence by *Process Studio*, Vienna Biennale, 2019. (https://process.studio/works/aifont-ai-generated-typeface)

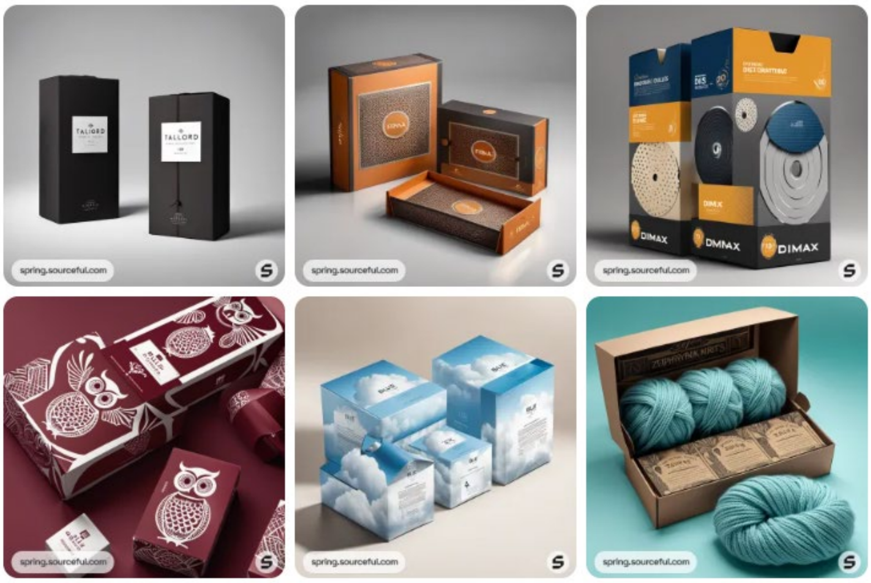

Figure 14d AI-Generated packaging examples by *Sourceful*, 2024. (https://spring.sourceful.com).

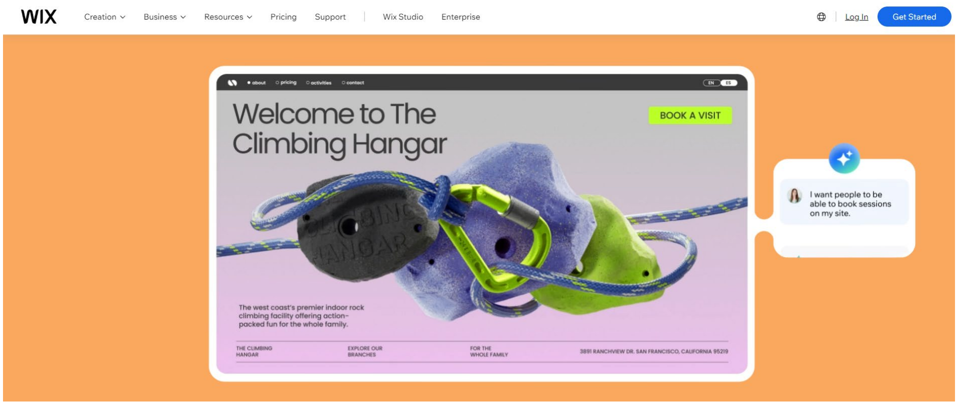

Figure 14e AI-Assisted web design interface created by *Wix Studio*, 2024. (https://www.wix.com/ai-website-builder)

Figure 14f Illustration examples created with artificial intelligence on *Midjourney*, 2024. (https://www.midjourney.com/showcase)

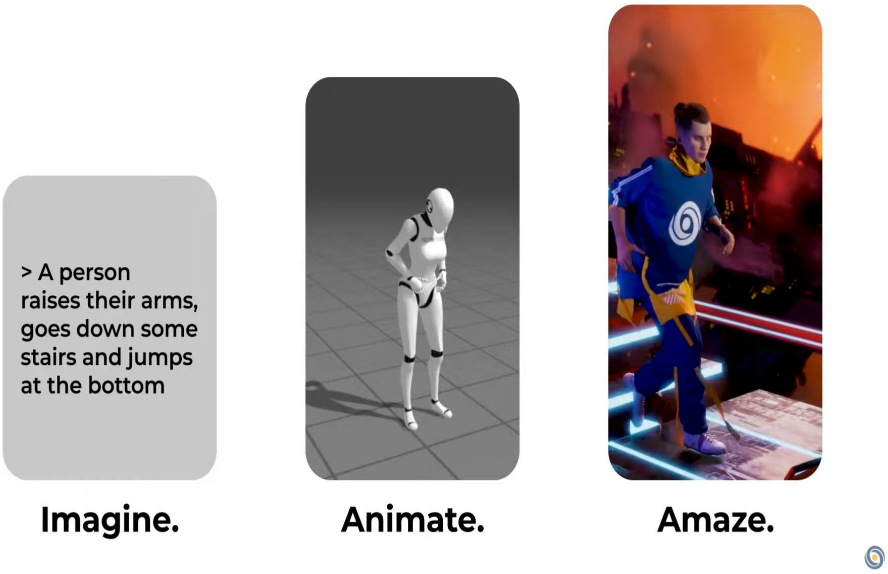

Figure 14g AI-Based animation production workflow by *DeepMotion*, 2024.

With the continual emergence of new models and the ongoing updates or enhancements of existing ones, both static and motion-based image generation have become increasingly capable of producing highly realistic visuals. Current models that employ the technologies discussed—particularly in static image generation, video production, and design assistance—include Kling, Sora, Runway Aleph, Pictory, Synthesis, HeyGen, Flux, Midjourney, Adobe Sensei, Leonardo, NVIDIA Canvas, DALL·E, DeepArt, Lora, Ideogram, and Grok Imagine.

Figure 15 Images generated using runway Gen-3 Alpha, Sora, Kling AI, Flux, Leonardo, and DALL·E Tools, 2024. (https://soorai.com/, https://klingai.com/, https://runwayml.com/, https://flux-ai.io/, https://leonadoai.com/, https://openai.com/index/dall-e-2/)

Conclusion and recommendations

Artificial intelligence technology continues to develop with ever-increasing momentum. When the progression of this technology from the 1950s to the present is examined, it becomes evident that its milestones—considered turning points—have been achieved both faster and more successfully than anticipated. Therefore, when projecting into the future, it is clear that the diversity and intensity of its applications will far exceed current predictions. Today, the use of artificial intelligence has ceased to be an optional choice; instead, the training and personalization of these technologies have become a standard process.

The AI-assisted image generation technologies analyzed in this study have created significant milestones in the field of creativity. The Generative Adversarial Networks (GAN) model, developed in 2014, successfully solved problems that earlier approaches could not address or handled with low performance, thereby reshaping the direction of generative artificial intelligence. AICAN technology, on the other hand, has moved generative AI beyond being merely a tool that proves its competence in positive and measurable sciences, positioning it at the very center of aesthetic perception. Indeed, in experimental studies, between 75% and 85% of human participants perceived AI-generated paintings as human-made. This finding has contributed to contemporary artists becoming more open to collaboration with artificial intelligence.

The findings in the field of graphic design are twofold. First, for areas with high-volume production, AI provides significant advantages—such as rapid creation of design variations, shortened production time, and the ease of manipulating visuals. Second, since works produced with different models often draw from the same data pools, there is an increasing risk of aesthetic homogenization. This situation has led to critical debates in art and design concerning uniqueness, originality, creativity, the social impact of art, and intellectual property rights.

The findings also demonstrate that AI-assisted production not only provides technical convenience but also transforms the identity of the artist/designer and the nature of the creative process itself. In traditional production, the artist is at the center of both conceptual and technical decisions. However, in AI-assisted production, this role is gradually evolving into one of curation, direction, and selection. This transformation raises essential questions about the definition of creativity, the value of human contribution in the production process, and the locus of creative authority.

From an ethical perspective, the use of copyrighted or non-anonymized content in datasets employed by AI models may result in intellectual property violations. Moreover, the tendency of algorithms to shape aesthetic preferences carries the risk of reducing cultural diversity. For this reason, establishing ethical standards for the use of AI in art and design—and ensuring transparency in dataset creation and model training processes—has become crucial.

In conclusion, the presence of artificial intelligence in art and design not only transforms creative practices but also deepens ethical, social, and legal debates. Awareness of the stages of production, the functioning of algorithms, and the effects of image generation models on outcomes has become an indispensable step for contemporary artists and designers aiming to train and personalize AI systems. In the future, the positioning of this technology not merely as a tool but as a conscious and responsible creative partner will play a decisive role in the evolution of art and design.

Author contribution

The first author contributed 100% to the study.

Conflict of interest

I declare that my article titled *"Use of Artificial Intelligence Supported Image Production Technologies in Art and Design"* has no financial conflict of interest with any institution, organization, or individual.

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