

# The Age of Intelligent Reproduction and Machine Learning Creativity

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Walter Benjamin's most celebrated essay, *The Work of Art in the Age of Mechanical Reproduction*, from 1935, anticipated the impact of different technological advances on artworks. The essay unfolded the political implications of the new emerging technology-based art forms of his time—photography and cinema—and its effect on the relationship between art and the public. Benjamin argued that technology alters the way art is experienced (Benjamin, 2008, p.14). Artificial intelligence is the latest technology that is having a vast impact on the cultural ecosystem.

Benjamin—a Jewish German, philosopher, cultural critic and essayist—lived during the radically transformative period of the early decades of the 20th century modernity, of modern industrialization and mass democracy. This was a period when many modern technologies were invented and popularized, such as the telephone and automobile. Also, transport infrastructures such as trains, underground transport, highways, commercial aviation and established mass

media like newspapers, radio, cinema, and television all began to take shape. All those technological advances had a significant impact in changing society and city life and on the public perception of the potential of technological progress. The movie *Modern Times* by Chaplin, made in 1931, is a satirical picture concerning the radical transformations of the period, portraying man versus industrialization and workers' relations with machines. These radical historical changes clearly influenced Walter Benjamin's work and thinking.

In *The Work of Art in the Age of Mechanical Reproduction*, Benjamin introduced his theory about the *aura* of artworks. The aura is essentially the unique "here and now" unique existence of a particular artistic object. The author argues that a reproduced artwork loses the artistic object's authenticity or aura, by losing its singularity or originality. Of course, the work of art has always been reproducible by some form of man-made copy, but the introduction of technology-based art forms like cinema changed the function of art in modernity. By representing the environment in moving image form, film has the potential to enrich our field of perception. These new forms of art created new audiences and served to redefine the functions of other already existing art media. Benjamin considered how art had previously been developed or distributed and how these new technologies changed the definition of what art is.

The Polish philosopher Zygmunt Bauman in his book *Liquid Modernity* distinguishes between 'heavy' modernity, which describes the era of hardware, and the 'light' modernity that is the era of software. Heavy modernity is solid and is the period in which Walter Benjamin wrote his essays. Light modernity is described as liquid and bringing about radical changes in the human condition. "In the software universe of light-speed travel, space may be traversed, literally, in 'no time'; the difference between 'far away' and 'down here' is

cancelled.” (Bauman, 2000, p.117). Information society driven by software is overcoming the struggle with time and space that is the anchor of solid modernity. Speed has triggered and accelerated profound changes in society.

When it comes to current technological innovation, artificial intelligence is already shaping the world and our society just as much as the technological advances of the early modernity Benjamin described. Modernity changed the relationship between industry and labour, and today artificial intelligence is threatening to render obsolete a substantial part of the workforce, replacing jobs with artificial intelligence solutions. We are heading toward a point of technological singularity when technological advancement causes uncontrollable and irreversible change to society, thereby redefining the whole labour market. Our relationship with machines has been tense throughout modern times. Already in 1931, Chaplin said in a newspaper interview that “Unemployment is the vital question [...] Machinery should benefit mankind. It should not spell tragedy and throw it out of work.”(Chaplin, 1931). Further, we should not overlook the field of culture, where AI has also been deployed for expanding creativity and introducing new cultural media. The AI artist Anna Ridler discussed this topic in her presentation at the ISCMA conference in 2019. She confirms that there is a certain anxiety among the artistic community about the idea of machines creating their own art without the input of a human artist. However, Ridler argues that the arguments presented by researchers in the field mostly focus on the visual parameters, in this way ignoring a large part of what she considers art: the materials, process, and the intention of the artist with the artwork. For example, creative methods that use GANs (Generative Adversarial Networks) give the viewer different experiences and expectations of a work’s creative history than if an artist would decide to use photography or a drawing medium

(Ridler 2019). In short, AI will not replace the author. On the contrary, AI technology has become a novel tool for creatives.

Then age of machine learning is transforming the work of art and accelerating creativity by using algorithms and translations of semiotic spaces (Lotman 1990,143). Artificial intelligence is widely used for the translation of texts between different languages. Translation necessarily involves adaptations to the differences of meanings and structures between two different languages. Artificial intelligence allows translation to different mediums like image to text or text to image. Yuri Lotman has studied AI as a mechanism of creating new information, and one source of such creativity is the translation of semiotic spaces (Hartley, Ibrus, Ojamaa 2020, p. 145). The authors of *On the Digital Semiosphere* describe how efforts to translate between different semiotic spaces that are incommensurable, constitute the very essence of creativity. The use of translation systems can thus lead to the emergence of mutations that can be used by an artist to create new works.

There are similarities between the paradigm shift made during the age of mechanical reproduction theorized by Benjamin and the changes in the work of art in the age of machine intelligence. For example, digital art is arguably now the most reproducible of all art forms. AI is intrinsic to new forms of art-making process that reproduce by algorithmic learning from archetypes to produce new artefacts. According to Lev Manovich: “AI plays a crucial role in the global cultural ecosystem.” (Manovich, 2018). Machine learning has given machines the computational ability to learn from datasets to construct new artworks inspired by a body of initial material, such as images, text or sound. Moreover, AI is present in the distribution of cultural products in the web browser search algorithms that influence what we consume. Neural networks can learn to make music, images, movies, novels, and more. This is

an entirely new way of reproduction that is also capable of creating novel artworks.

The source dataset is central to the operation of these AI learning models. Hence, it is essential to understand the politics behind the training sets in machine learning (Crawford and Paglen 2019). In 2019, Trevor Paglen and Kate Crawford created an interactive art project *ImageNet Roulette*, which exposes biases in facial recognition algorithms. The project consists of a website that captures the viewer's face and tries to classify it by using an ImageNet dataset. This dataset is the most used in the area of academic research. The ImageNet library's main task is object recognition. In addition, it has a category for person recognition with thousands of subcategories that contain labels that are biased and can be racist, misogynist or otherwise offensive. The library continually fails at the difficult task of classifying humans. In the end, the project aims to cast a critical view on the AI models' systemic biases and how they impact society from the training data to the learning algorithms.

When it comes to artistic creative processes in AI machine learning, there are two ways to produce an artwork's aesthetic appearance from a dataset. The least laborious method is to use an existing data set or to curate a large dataset by selecting only the relevant or interesting content. The second, more laborious way, is to build one's own body of data for the algorithm to learn from. For example, this could mean taking a thousand or more photos of clouds and post-producing them. In the age of machine intelligence, algorithms reproduce learning and have implications for the imitation of the artistic singularity.

Generative Adversarial Networks, commonly known as GANs, are deep learning models that can generate images from a training dataset. For example, American artist

Robbie Barrat used the existing WikiArt paintings dataset, from which he selected nude paintings in order to train a GAN to create the series *Nude Portraits*. On the other hand, British artist Anna Ridler applies the creation of datasets at the core of her art practice. Ridler created a dataset of many thousands of tulip images in order to train the GAN models for producing her art piece *Myriad (Tulips)*. The artist photographed and hand-labelled thousands of tulips images, which were used in the GAN. In the end, we can say that producing a dataset is definitely intensive and time-consuming work, but it is worth the effort. To give an example, AI artist Helena Sarin, born in Russia and based in New Jersey, is known for building her own datasets and working with GANs. Sarin lists the advantages of building her datasets for artistic practices: to introduce more uniqueness and cohesion into her art, to produce a higher resolution image, to ensure a similar composition and colour using the same camera, and last, to avoid any worry about breaching copyright (Sarin 2018). When an artist wants to use pre-existing datasets they need to check if the copyright license for that dataset allows the intended use. The GANs models are also published with different types of license offering various permissions and restrictions on use.

The public datasets of cultural data published with a permissive license such as those of MIT are invaluable for artists and researchers working in AI. Companies like Google had already understood the value of digitized archives a long time ago, and in 2002 began to offer help and infrastructure to libraries for the digitization of books, and similarly enabled museums to digitize collections and archives in 2011. All the material that Google digitized in partnership with the museums is available online on their Google Arts and Culture Initiative website. The digitalization of the libraries is published in Google Books.

British Library Labs and the Google Culture Institute of Paris are two institutions that have invited artists to work with their digital library datasets and create derivative art projects. For instance, a German artist Mario Klingerman participated in the artist-in-residence program at the Google Arts & Culture Lab from 2016 to 2018. He also collaborated with British Library Labs in order to create AI artworks using their datasets. The pieces of art resulting from these processes revise and review through the lens of new creative tools the legacy of art history contained in these collections. Further, such approaches that connect archives and new technologies also help to contextualize novel practices in art history and humanities. Additionally, we can see new narratives emerging from the use of data as artistic material and repurposing archives as a latent space for creative processes. Ibrus and Ojamaa highlighted the technical possibilities of digital archives, focusing on how the “creativity of archives” (relating to Lotman’s theory of the “creativity of texts”) facilitates cultural dynamics by re-combination, creating new meanings (Ibrus and Ojamaa, 2020). That means it can be used artistically through machine learning and latent space navigation.

The term ‘latent space’ refers to a multidimensional mathematical space that contains what the neural network has learned from a training set. This mathematical space in the GANs includes many millions of possible images that the model can generate based on the dataset and the model’s learning stage. The latent space of a neural network is its internal representation or memory of the world. “Much of the work that artists do with GANs is to explore the latent space and experiment with different ways to generate z vectors.” (Hertzmann 2019). Navigation through latent space is a creative process of unveiling the creativity of the model. The models perceive the world in different new ways making connections between seemingly

unrelated phenomena. In the mode of exploration described by Hertzmann in his *Aesthetics of Neural Network Art*, the artist finds the hidden patterns and generates what Hertzmann describes as the unusual combinations of realistic visual cues (Hertzmann, 2019). In some ways, AI can help to demystify the concept of creativity. If creativity is the act of turning new ideas into reality, artists using AI models can navigate all the stored ideas in the latent space and make it a reality.

The images generated by navigating the latent space of GAN models can form animated videos made from the synthetic content. *Deep Meditation*, an artwork and article by Turkish-born, UK-based artist Memo Akten, researches and artistically explores the meaningful control of trajectories in latent space in order to help to discover narratives for constructing stories in time-based media, such as video (Akten, 2020). Latent space navigation of GANs is often used in works by Turkish-born and Los Angeles-based artist Refik Anadol. Anadol coined the term ‘latent cinema’ (Kivrak, 2020) to describe a body of his works using artistic navigation through latent space. He is an artist who explores the intersection of art and artificial intelligence using a variety of media including data sculpture, audiovisual performance and immersive installations. In 2019, Anadol presented the AI work *Machine hallucination* at Artechouse in New York. The work is a 16K resolution video piece of latent history that travels through the memory of an AI model of 100-million historical photographs of New York City. The artist describes it as “a novel form of synesthetic storytelling through its multi-layered manipulation of a vast visual archive beyond the conventional limits of the camera and the existing cinematographic techniques.” (Anadol, 2019)

Artechouse is a new kind of museum of art and technology with an immersive digital exhibition that uses digital projection to immerse the audience in the experience. In the

Artehouse website presentation, the art director and founder Sandro Kereselidze writes, “Every city has a destination for fine arts, theatre, music, and film. Our goal is to be the home in those cities for an innovative, 21st-century art that is created at the intersection of art, science, and technology.”(Kereselidze 2021). The statement recalls Benjamin’s idea regarding technological advances that create new audiences and new forms of distribution. In recent years a new kind of exhibition space with immersive 360 degree projection spaces has opened in numerous cities around the world, including among others: in June 2017, Artehouse in New York; in April 2018, Atelier des Lumières in Paris; in June 2018, the Mori Building Digital Art Museum in Japan; and in October 2019, Ideal in Barcelona. The idea behind these immersive exhibition spaces comes from the cave projections that institutions like Ars Electronica Center first introduced in 1996 and updated in 2009 to *DeepSpace 8K*. These new innovative venues introduced popular content to mass audiences, such as exhibitions of the big names from art history, such as Claude Monet and Vincent Van Gogh. The museums also put on shows that celebrate 21st century art including the AI art of Anadol and *Ouchhh* collective. The most recent of these AI exhibitions is *POETIC AI*, which was presented at Atelier des Lumières and later on at Ideal in Barcelona. These new museum spaces enable different exhibitions to be held in the same space at different times of the day, since it is all based on digital audio-visual and interactive software and projections that can be changed with just the click of a mouse button. What is more interesting is that the same exhibition can also be shown in several museums at the same time.

We also see the influence upon and by the art market, although it remains dominated by tangible art in the most concrete sense, even in the novel field of art that has been made using AI. Images generated by GANs are a very

popular medium for artists working with AI and there is wide interest in the market. In 2018, the french AI art-collective *Obvious* sold the first AI-generated artwork in an auction for \$432,500 (Vincent, 2018), thereby generating further interest in the form from market investors. Digital images generated by AI can be distributed online, be printed and appear in artist books, or even be sold in CryptoArt markets, like NFT ('Non-Fungible Token), which is sold using cryptocurrency and with smart contracts on the *Ethereum* platform. Helena Sarin has been using these distribution media with her GANs practice. The artist is very active on Twitter, where she shares her latest creations. Sarin created a self-produced book called "GANesis" in 2019. She has also been selling her pieces on *Superrare* and *Rarible* since 2020—two popular CryptoArt markets for selling NFTs. In all these markets, the most popular medium in which to sell an NFT is an image, but it is also possible to sell other formats like short videos and 3D models.

In the end, culture and technology are not neutral, both are political. Artists working with art, science, and technology are deeply engaged with AI research for the purpose of artistic exploration. Many artists are early adopters of AI models published by scientists and companies with AI research teams. However, an alarming tendency is that some models are released in close circles that remain unknown and are not accessible for the larger public. Researchers and artists need to request permission from those large corporations to obtain beta access to their models and infrastructures like *OpenAI*. This happened for the first time with the release of the language model GPT3. Art needs to be critical and conceptual. It is essential for cultural productions to be involved in technological development in the age of machine intelligence. The work of German-Iraqi artist Nora Al-Badri is an example of this critical thinking applied to AI art. She contacted the

five museums with the largest collections of Mesopotamian, Neo-Sumerian, and Assyrian artefacts to request access to images of their collections. She was denied access to those digital archives and so she decided to web-scrape 10,000 pieces from the museums' websites. With all that visual material, in 2020 she then trained an AI model to create *Babylonian Vision*, a speculative view of archaeology and de-colonised use of machine learning, thereby generating a "techno-heritage". Al-Badri describes her intervention with AI as follows: "Ironically, this black box problem can now be used against the museum, against the colonial machine. We more or less know who/where the largest collections in the world are, but they cannot prove that I used their datasets to train the system. In many instances, the black box aspect of AI can be a problem but in some cases, it can also be liberating." (Debatty 2021)

Benjamin's insight in *The Work of Art in the Age of Mechanical Reproduction* clearly has parallels with the age of artificial intelligence. Throughout modernity, technology has shaped society, influencing and reshaping cultural production and continues to do so in our AI-infused everyday life. Cultural production embraces each era's technological innovations; as Benjamin said, "The manner in which human sense perception is organized, the medium in which it is accomplished, is determined not only by nature but by historical circumstances as well." (Benjamin 2008, p.5). Technology-based art forms like cinema changed the function of art in the 20th century. Artificial intelligence is now redefining the world and media such that text may become music, music may become images, and images may become text; and this loop is endless. Technology is continually altering the way art is experienced, just as Benjamin predicted. Furthermore, the work of art has acquired even more political significance as we approach the edge of technological singularity.

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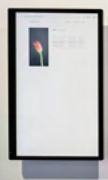
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