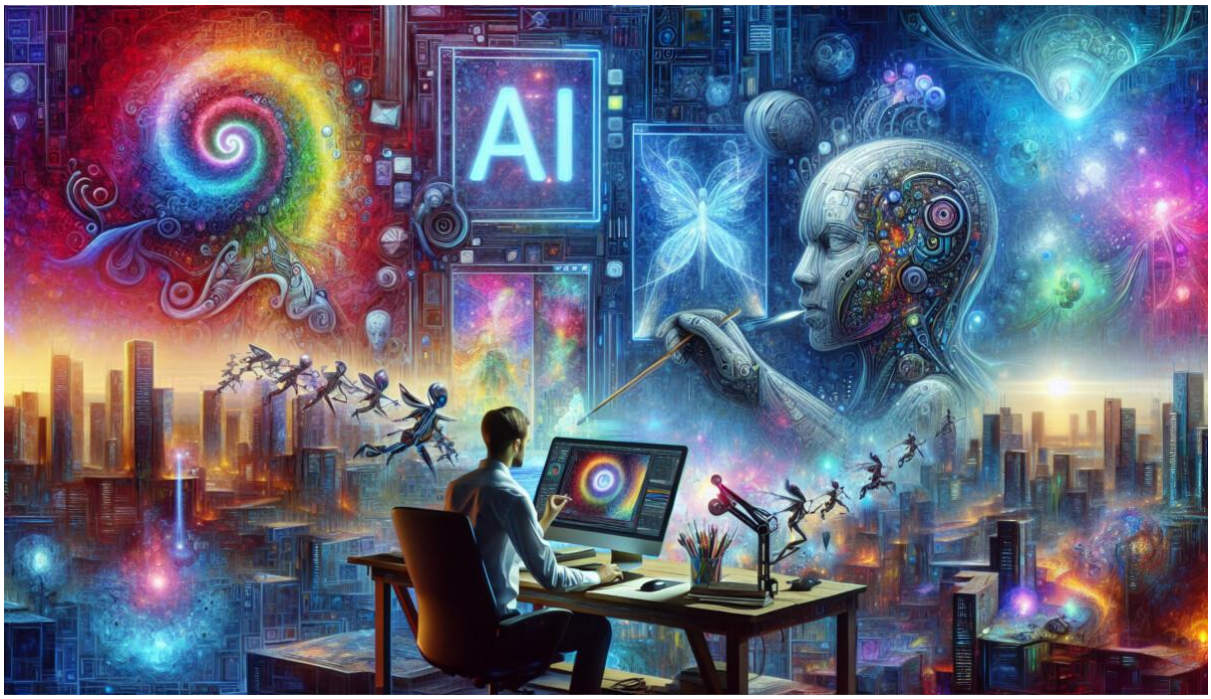
Erasmus School of
Social and
Behavioural Sciences

# State of the Art

Master research on how AI has changed making art.

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Erasmus University Rotterdam

# Preface

During the last few months, I have worked hard on this Master Thesis. For me. lot of things in my process were really knew, but it felt really empowering to try something new and to completely delve into a new topic. Art in the era of AI is something that has really captivated my interests for quite some time, so this master thesis felt like a little art project on my own. Hopefully, you do not see it as abstract art, but as a state of the art about creative work made with AI. In prior projects I mostly looked at the negative reactions and opinions about art made with AI, but it was so nice to see and hear about its potential and how artists integrate this technology into their creative work process.However, I could not have done this research on my own and I would like to thank some people. First, thank you to Francisca Grommé who offered so much guidance, support and enthusiasm during the whole process. It was nice to have someone to go to if you were stuck somewhere and most of the time it really cheered me up and gave me some new motivation and energy. Second, I want to give a big thank you to all the artists who were willing to talk about their work with me. It was a pleasure to meet them and I really enjoyed all their personal stories. And lastly, my lovely fellow students who were a great shoulder to lean on. Thank you for that. Even though, I had a rough start and some hiccups. I am proud on what I have achieved, and I look back on this positive. I hope you like reading this paper.

Stay creative!

**Lilian ten Have**

# Abstract

In this master thesis research, a multimethod study was conducted about the state of the art on how artificial intelligence has changed the way people make art. In the literature and media, AI art raised many questions surrounding originality, novelty, authenticity, human connection, and creativity. This research aimed to explore further how AI has changed the creative work process of artists. A total of 23 artists websites were analysed, five in-depth interviews were conducted, and one field observation was done at the first AI gallery. Based on a thematic analysis, it became clear that all artists who create with AI or related technologies have a big interest for technology and have prior knowledge. Motivators for making art with AI could be divided in five categories: societal, scientific, technological, natural, human life, and knowledge motivations. Artists see working with AI as a collaboration and can be seen as co-creative. Next, it was also a way of addressing and criticizing the current socio-technological systems we live in. With this research, more information was gathered about using AI in the creative work process. It has shown that artists are aware about the possible negative implications of AI. In some way, artists have become more transparent about their process. Lastly, more understanding was created about concepts related to co-creativity and art entrepreneurship. Overall, artists saw technology as an extension to their toolbox, a new kind of collaboration, creating new art experiences, enhancing their own creativity, and an adaption to their creative work process.

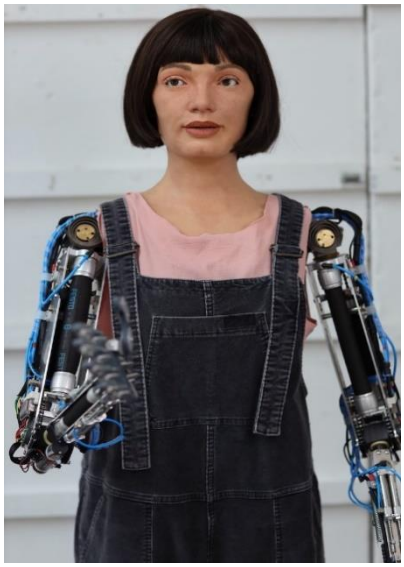
**Keywords: artificial intelligence, art, art entrepreneurship, creativity, co-creativity, technology**

# Introduction

"The world's first ultra-realistic humanoid robot artist" is the 'girl' also known as Ai-Da (Ai-Da, 2019). Ai-Da was created in February 2019 in the United Kingdom. She can draw and paint because of the cameras in her eyes, her artificial intelligence (AI) algorithms, and her robotic arms (see figure 1). Ai-Da already had her first solo show at the University of Oxford and had several exhibitions in museums. But can we call the work that she made art? In the academia and media, this question is often debated and critiqued. The discussion is often about if a computer can be artistic, creative, and can create the same response as humans (Coeckelbergh, 2015; Chamberlain et al., 2018; Demmer et al., 2023). This robot artist shows you how the physical and digital world interact with each other and are becoming more intertwined. She is just one of the many examples of how AI technologies have impacted creative work. Many artists around the world are now exploring, experimenting, and playing with new technologies in their creative work process.

**Figure 1**

*Ai-Da (2019)*



Much scientific research has been done about how digital technologies stimulate innovation and creativity (Amabile, 1988; Amabile & Pratt, 2016; Carabel-Montagud et al., 2018; Townsend & Hunt, 2019; Ciarli et al, 2021; White, 2021; Siemon et al, 2022). However, there is no consensus about the definition of creativity. In the literature, creativity is most often seen as a dynamic process that consists out of different elements (Amabile, 1988; Amabile & Pratt, 2016; Wingström et al., 2022).

New technologies, such as AI and robotics, have caused tensions with the human-centred perceptions on creativity that argues that only humans are capable of being creative. Coeckelbergh (2015) shows from a philosophical viewpoint that the distinction between process versus outcome criteria, and objective and subjective criteria of creativity are very unstable. Other questions are about issues related to authorship, ethics, but also related to novelty, originality, and autonomy in art made with AI and similar tools (Cetinic & She, 2022). A reason there is much critique on

art made with AI is because many artists do not reveal details of their creative process. Based on that reason the following research question was formulated to get more insights into the creative work process of artist who make art with AI:

*How has AI changed the way of making art?*

Next, the following two sub questions were formulated to look at how artist present their work process in relation to AI, and what drives them to use these kind of technologies.

*How do artists present their creative work process in relation to AI?*

*What motivates artists to integrate AI in their creative work process?*

To answer these questions, a multi-method design was used. First, 23 artist websites were analysed to see how artists present their creative work online. Second, a field observation was done at *Dead End Gallery* in Amsterdam, the first ever AI exhibition in the world. Lastly, five in-depth interviews were conducted with artists who use AI or similar technologies in their work process. With the data there was looked for similarities and differences in order to gain more information about the creative work process of artists.

In the literature it is told that AI affects the way people experience art and their work processes, but not much is known about this (Chamberlain et al., 2018; Reiners et al, 2021: Cetinic & She, 2022; Demmer et al, 2023). This research is theoretically relevant since it aimed to gather more information about the creative work process. Second, much research has been done about the connection between digital technologies on creativity, but not much about the creative sector and AI. The societal relevance of this research is that it could lighten issues related to authorship, ethics, but also related to novelty, originality, and autonomy if more is known about how artists use AI. Second, art is often seen as a bridge between people and technology, and it is worth studying if art is being perceived different if people know that AI used (Chamberlain et al., 2018: Demmer et al., 2023). Lastly, this research hoped to shed light and share the opinions and experiences of artists on why their work is still creative and artistic. This research could also function as a foundation for policymakers for the creative and cultural sector about fair allocation of cultural funds. This way also issues that were mentioned above could be avoided, tackled and or addressed. In the next chapters, the following things will be discussed: theoretical framework, methodology, field observation, personal website analysis, interview analysis, discussion, and conclusion.

# Theoretical framework

Art historians have marked the year 2022 as the beginning of creative AI (Hutson & Harper-Nichols, 2023). The rise of new AI tools like ChatGPT and Stable Diffusion has interrupted the established practices of the art scene and has caused several discussions about the validity of "AI Art". From a philosophical point of view, Coeckelbergh (2015) argues that technology makes us reflect on the role of technology in art creation about whether machines can indeed create art. Applying his insights to AI, it implies that process versus outcome criteria and subjective versus objective criteria for creativity are unstable.

However, fears about the downfall of artists are unnecessary if we look back at the historical adoption of new technologies by artists, such as photography and photoshop. When these technologies came out, other disciplines did not seize to exist either. According to Hutson and Harper-Nichols (2023) artists should implement generative content in their work in such a way that it is meaningful and innovative. Second, artist can help shaping the direction of art made with AI by forming new ways of creative expression and meaning making in the process. In this research there will be referred to art made together with AI as "AI Art". The artist is still the main contributor and the term will just suggest that art was made with the help of AI. This research aims to build further on the recommendations of Hutson and Harper-Nichols (2023) by looking at different perspectives on the creative work process and AI Art.

## The rise of AI in artmaking

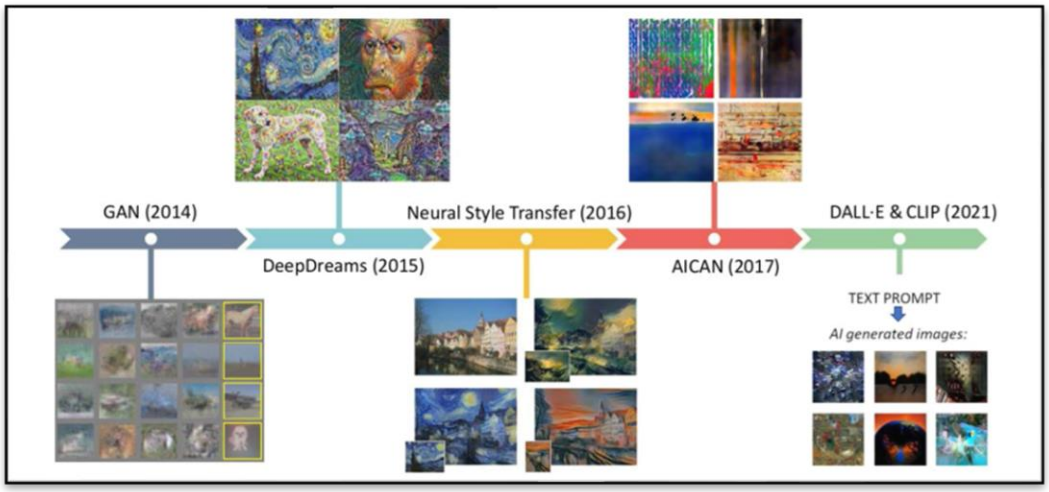
In 1998, cognitive and computing scientist Margaret Boden wrote "*Creativity is a fundamental feature of human intelligence, and an inescapable challenge for AI*" (p.347). Since then, much more research has been done about the creative potential of AI. In this paper, AI is being defined as a computational system that shows behaviour that would normally be considered intelligent if a human performs the task (Wingström et al., 2022). Think for example about learning, problem-solving or making art. With the rise of machine learning in AI, the critique is most often about lack of interpretability, limitations, risks, and social challenges that have come forward with machine learning (Cetinic & She, 2022). Comprehension and appreciation are often still seen as a capability only humans have. From an application and communication point of view, Cetinic and She (2022) explored how AI can advance digital art, and inspire our perspective on the future of art.

To gain more knowledge about the application of AI in art production figure 2 shows

the most important technological advancements with some examples that have influenced making AI Art (Cetinic & She, 2022). From a computer graphics and computer vision perspective, these algorithms for creating art are designed to change images in several ways, including applying a certain "art style" to the input image, such as making a picture look like a Van Gogh painting. The technological innovation that contributed the most to the current state of AI Art were Generative Adversarial Networks (GANs) in 2014. The main mechanism of a GAN is to train two "competing" models that are most often applied as neural networks: a producer and a discriminator. The purpose of the producer is to capture the distribution of the real examples of the input sample and to make a realistic image, while the discriminator is programmed to classify generated images as fake and the real images from the original sample as real. After GANs there was DeepDreams, Neural Style Transfer, AICAN, DALL-E and Clip, which are most often adaptations and or better versions of earlier programs. Lastly, it is important to remember that AI is often divided in multiple subcategories, such as machine learning, machine vision, and natural language processing.

**Figure 2**

*Illustration of some of the most important technological milestones for AI Art production (Cetinic & She, 2022)*




## The debates surrounding AI Art

The recent year art made with AI got much critique but are not something new. In 1998, Boden said that to call something a creative idea it must be novel, surprising and valuable. Boden (1998) distinguishes three types of creativity that AI can generate

combinations of familiar ideas, 2) exploring the potential of conceptual spaces, and 3) making transformations that allow the generation of previously impossible ideas. All these forms of creativity can create a form of novelty. However, according to her, AI around that time was mostly capable of making transformations based on earlier ideas and work. It has novelty, but it is not creative or valuable, because there is not such as thing Boden (1998) calls a “shock” factor.

Since then, AI has developed a lot as shown in figure 2. AI has become more advanced, and the possibilities have broadened. From a more psychological perspective, Chamberlain et al. (2018) investigated how observers reacted to work produced by either a human or a computer. Several factors are known to influence the judgements of artworks. Art philosopher have said that both the process of making art and the product is important. The value of art is often determined by the amount of physical contact the original artists have with the artwork. Chamberlain et al. (2018) looked at robotic art, which is a category of computer-generated art. What makes robotic art different than, for example GANs, it that there is a physical embodiment process. The results of the study showed that observers were influenced by the characteristics of the computer-generated artworks as well there were negative biases about computer-generated art and its ability to make aesthetic work. First, seeing the robot making the work, gave observers insights in the creative work process which resulted in more aesthetic appreciation (Chamberlain et al. 2018). Second, the results were moderated by how anthropomorphic the robot appeared to the watcher. Anthropomorphism is giving human traits to non-human things. Based on the results, Chamberlain et al. (2018) recommend that increasing the “human” qualities of robotic and computational art could increase societal engagement and decrease negative attitudes towards artistic AI. This idea of anthropomorphism is interesting to keep in mind when looking at the relationship between artist and the AI.

Moffat and Kelly (2006) conduced a similar study to that of Chamberlain by using musical pieces composed by either a computer or a human. This research also showed that participants were influenced by if the music was made by a computer or human. What was interesting is that musicians showed a greater bias towards computer-generated music than nonmusicians. It is interesting to check whether artists making AI Art also have this bias towards generated art.

Where Chamberlain et al. (2018) looked at robotic art and the aesthetic responses of

viewers. Demmer et al. (2023) can be connected well with this research. They have investigated how AI reshapes the way individuals interact with art and how we reply to art made with AI. People's negative reactions about AI art are most often about the artist's *intensions,* and the *emotional engagement* on both maker and viewer side. As mentioned by both Boden (1998) and Demmer et al. (2023), an important aspect of artmaking is putting a novel or a feeling into an artwork and transmitting it to the viewers. According to critics, AI is not able to have emotional intensions, and it thus cannot be seen as art. Demmer et al. (2023) researched if it is true that people do not feel emotions when looking at art when they know it is computer-generated. They investigated to what extend participants made an emotional connection with computer-deprived art. The results from this study were that participants still had emotions when looking at the art and that they did assigned intentions to it, regardless of if the work was made by a computer or a human artist. In this research, there will be looked more into how artists still create intensions, novelty, and emotional engagement with their artworks. Lastly, there will be looked at if AI made it harder to achieve these things.

## Using AI in the creative work process

### AI in the creative work process

In the earlier parts, several discussions surrounding art made with AI were discussed about topics such as novelty, autonomy, and originality. In this part, there will be looked more into depth how AI and other technologies have changed the meaning of creativity and artistic practices (Edmonds et al., 2005; Mangematin et al., 2024). In the literature, there is no consensus on the meaning of creativity, but there is some agreement on the aspects related to it. Creativity is often connected to concepts such as innovation, novelty, and originality (Edmonds et al., 2005). Aspects such as usefulness or social and cultural significance are also considered to be important traits of creativity. Amongst creativity researchers there seems to be an overall agreement that creativity happens when there is a good combination of factors such as personality traits, social influences, environmental restrictions, and cultural principles, but there is no strict process or cycle for creativity in order to happen (Amabile, 1988; Edmonds et al, 2005; Amabile & Pratt, 2016). Wingstrom et al. (2022) mentions the following aspects related to creativity: actor, process, outcome, domain, and space. In this research, the creative work process of an artist is defined as a dynamic process consisting out of multiple aspects, such as creativity, actor, outcome, domain, and space. Creativity or

‘being creative’ is included as a characteristic of the creative work process because it is seen as a crucial element to the work of an artist.

AI has phased many questions about whether it can be creative and intelligent. However, several researchers do see the potential in making art with AI (Edmonds et al., 2005; Wingström et al., 2021; Demmer et al., 2023; Nordström et al., 2023). Edmonds et al., 2025) mentioned that making art with AI can help with creating online creative communities, creating interactive art environments, supporting collaborative creativity, creating software environments for creating practice, and making image-sound systems in digital art practice. These possibilities are worth checking if artist make use of AI in such a way that in can stimulate these benefits.

### Co-creativity

The research from Edmonds et al. (2005) has a multidisciplinary approach with foundations in human-computer interaction and creative practice in art, design, science and engineering. Based on a case study, they have developed three models of collaborative creativity through technology. These models consist out of three main activities: creative conceptualization (the ideas and motivations for the work), construction (creating or implementing) and evaluation (can be on the product or process). This model was originally created for supporting collaborations with artists and technologist. However, these models are rather helpful in looking at were in the creative work process AI is being used and how artist perceive their relationship with AI. Therefore, the role activity matrix (see figure 3) was filled in for the three different models that they distinguish: 1) assistant, 2) full partnership, and 3) partnership [artist in control] (see figure 4). In the first model, AI as an assistant is seen as a collaboration where the artist comes up with the concept, the AI makes the product, but the artist does the final evaluation and maybe changes things. In the second model, the artist is in a full partnership with the AI. Both come up with ideas, they create together, and there is both human and computer evaluation on the final product. And last, in the third model there is a partnership between the artist and the AI were they create together, but the final evaluation is done by the artist. This research aimed to explore with which of these models’ artists resonate the most.

**Figure 3**

*Rol/Activity matrix (Edmonds et al., 2005)*

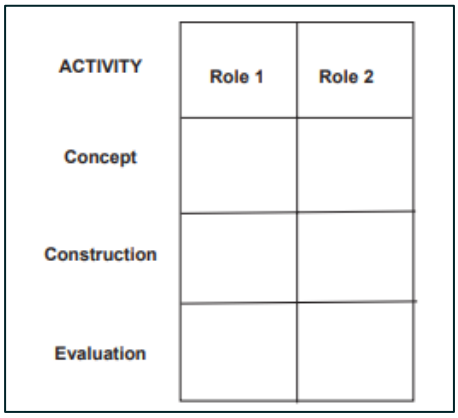
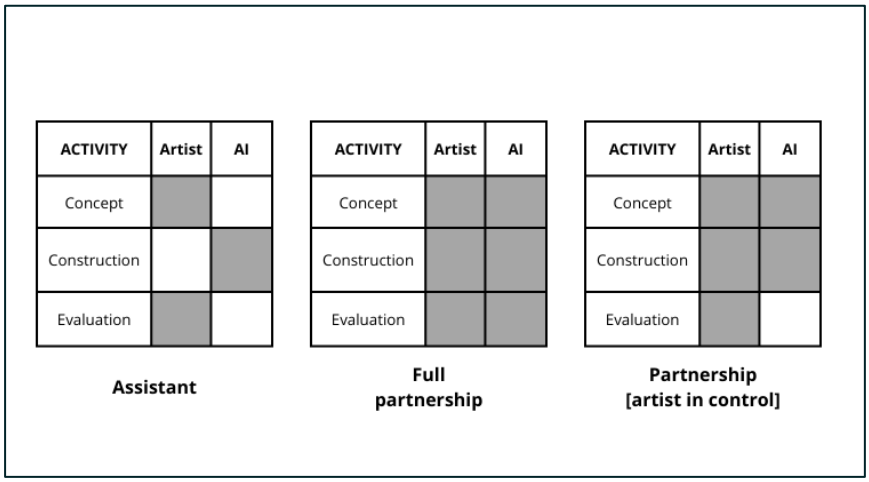



**Figure 4**

*Role/activity matrix for AI and artist collaboration*




Fauchart et al. (2022) is an interesting add to the work of Demmer et al. (2005). From a more management and organizational perspective, they suggest that using digital technologies can affect creative work processes and if people are either creating alone or together. Based on data collected from French musicians, they show that digital technologies are being used differently; several artists use them to work alone while others employ new technologies to work with others. Fauchart et al. (2022) mentioned a few more other effects of technology use on the creative process. First, digital technologies can stimulate assemblage and combining earlier knowledge to stimulate individual creativity. Second, it can aid artist in working together with others if they lack certain skills. Even though this research was about musicians, since these people are also a type of artist, it is worth checking if making art with

AI has affected working together or alone.

If we go more into how artist create with AI, the concept of ‘co-creativity’ received a lot of attention in academic literature (Davis, 2013; Wingström et al., 2021; Demmer et al., 2023; Nordström et al., 2023). Co-creativity is here being described as the different ways of blending human and AI creativity. Wingström et al. (2021) conducted a study amongst computer scientist and new media artists who use AI in their work process. As mentioned before, there is no consensus about if AI can be creative or intelligent just like humans, hence can it be co-creative. However, there are some aspects where there is agreement about. Co-creativity is often seen as a mixture of different skills, such as the processing of information, motoric skills, and reasoning. Wingström et al. (2021) distinguish two mayor perspectives when we talk about co-creativity. The first perspective ‘independently creative AI’ focuses on making AI that simulates human creativity. The second perspective is developing AI that is co-creating with humans.

Nordström et al. (2023) build further on the idea of Wingstrom et al. (2021) from a geography perspective, by saying that co-creative artmaking processes between AI and humans shape new *Artworlds.* Artworlds refer to the two-way relation whereby artworks shape worlds (i.e. how art performs in the world), and worlds make artworks (i.e. how the world in which art is produced shapes art). Co-creativity is originally a concept from the field of computational creativity, which is about the how people and AI interact, collaborate, and help within a creative process. Next, Wingström et al. (2021) did suggest that AI causes tension with the idea of creativity being a human trait. However, the results did support the idea that AI fuses science and the arts. Respondents considered developing AI to be artistic work, while others said they need computer science skills to use AI. This result is well aligned with the research of Fauchart et al. (2005) and Demmer et al. (2023) about how digital technologies can stimulate working together with others. To conclude, co-creativity aims to mix the creativity of humans and AI in an interactive work process (Wingström et al., 2021; Demmer et al., 2023; Nordström et al., 2023).

### New socio-technological systems

Building further on this idea of co-creativity, digital technology systems, here AI systems, can be considered as socio-technical systems (Caramiaux, 2020; Siemon et al., 2022). Here social-technical systems are being defined as the interaction between people, the creative work process, and technology. Based on two studies, Siemon et al. (2022) state that

AI can function as a creative assistant for entrepreneurs or as a creative assistant. These two functions seem similar to the role/activity matrix from Demmer et al. (2005) which makes this also interesting to look at in AI art. Based on the study, four aspects were defined about how AI can contribute to creativity: person, environment, process and divergent thinking. Divergent thinking is the process of generating creative ideas by looking at different solutions (Siemon et al. 2022).

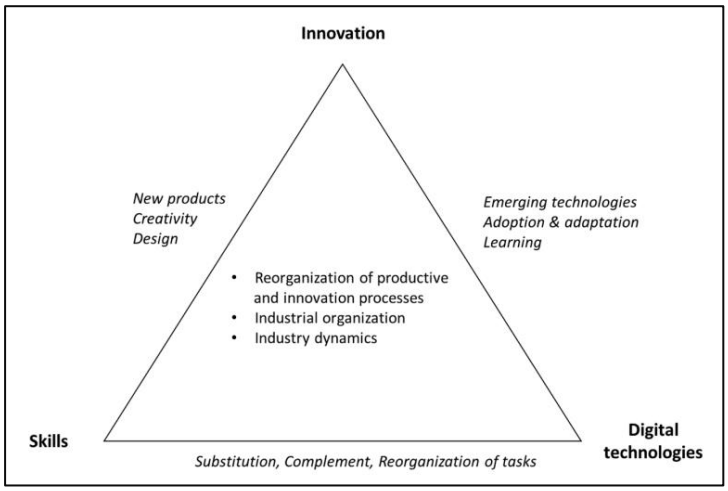
Caramiaux (2020) also mentions that digital technologies are both social and cultural. That is because these technological systems use data that captures socio-cultural expression such as music, video, images, text, and social interactions. Then it uses this data to generate predictions or other output. So, we could say that digital technologies enhance digital heritance and social structures. This is because technologies make it easier to preserve things. This research aims to explore the challenges and opportunities of AI in creative practice more and what motivates artists to create with these tools. By looking at concepts such as novelty, co-creativity, social-technical systems, more insights into the artistic process might come forward.

## Art Entrepreneurship

In the literature, creativity is often mentioned in combination with innovation, but not much to artmaking (Amabile, 1988; Amabile & Pratt, 2016). According to Amabile and Pratt (2016), creativity and innovation stimulate each other and goes in both directions. However, in their research, digital technologies are not included. To link innovation with the creative work process and digital technologies, Ciarli et al. (2021) provide an overview of the interdependence between innovation, skills, and digital technologies (see figure 5). This model is relevant to look at because the concepts in it are often studies separately. This overview can help with understanding of the connections between digital technologies, innovation, and creative work.

**Figure 5**

*Interconnections between innovation, skills, and digital technologies (Ciarli et al., 2021)*




Since there is much overlap between innovation and creativity, the concept of Art Entrepreneurship as discussed by White (2021) will be used to combine ideas surrounding creativity and innovation. Entrepreneurship is something that if already linked to the art sector, but this new type seems more applicable to artists. Art Entrepreneurship can be defined as "*the systematic practice of art innovation, art market creation and art value exchange."* (White, 2021, p.6). *Art innovation* is the introduction, diffusion, and widespread validation of new art forms in the artworld. Thus, in this case AI art. *Artworld* is a social system that consist of all the people who work together to co-produce, and co-present art in society. *Art market creation* means that you try to cultivate and shape customer tastes, demands, and preferences for new art forms. *Art value exchange* is the transaction that takes place when someone buys an object or experiences associated with art. In this paper, art will be referred to as both an object as an experience, as mentioned by White (2021). This research will look further into Art Entrepreneurship in relation to creating art with AI.

# Methodology

## Research approach

In this research, a qualitative explorative approach was taken, due to the new character of this topic. A multidisciplinary mindset was taken depriving from several fields, such as sociology, psychology, and computer science. As mentioned before, AI in creative work has gotten much critique. This research aimed to shed light on both the challenges and possibilities of making AI art. To go in-depth, there was looked at how artist present their work both online and offline in relation to AI. This way more data and knowledge could be gathered about their creative work process, and their motivations for creating with AI. Next, this research looked more into the concept of art entrepreneurship and co-creativity. Since using AI technologies in art is relatively new, there was still an open eye for related and similar technologies. Therefore, technologies such as robotics and complex algorithms were also included.

## Sample selection

In this research, the focus is on artists who make use of AI somewhere in their creative work process. Participants were selected using purposeful sampling, based on the following two criteria: 1) artist must use AI or related technologies, such as algorithms or robotics, and 2) they must define themselves as artist. This group is interesting to look at since not much is known about them, this kind of artmaking is really new, and this way more information can be gathered about their creative work process. During the desk research, emails were collected to send artists interviews for a possible interview. Two respondents were found using snowball sampling. To find artist, there was looked for artist living in The Netherlands and in other countries to maximize the response rate. Respondents were contacted through email, or by filling in their contact form on their personal website. Also, a flyer was added to the email to give prospective interviewees more information (see Appendix A).

## Data collection & operationalization

To answer the research question, multiple methods were used. The first reason for doing so, was because not much social scientific research is available about this group of artists yet. The second reason is that artists can be quite busy, and some artists are very

internationally known, so to get enough data, multiple methods seemed most needed. At the end, a total of 23 personal websites were analysed in a desk research, five interviews were conducted, and a field observation was done at *Dead End Gallery*, an AI gallery.

### Desk Research

The goal of the desk research was to look at how artist present themselves online and what you get to know about their creative work process on their website. This way there could be looked at which technologies they use, and how, but also what motivates and inspires them to create with AI. During the desk research, the following data was collected.

- Name
- Search term
- Visit data
- Type of technologies and tools
- Nationality
- Website links
- Email
- Text or video transcripts
    - Biography
    - Work descriptions
    - Other relevant information

In appendix B, a full table with the general information of the artists can be found. The artist names are hyperlinked to their website. The emails were only used for contacting artists, they are not included in the table. In total 23 websites were analysed which were gathered typing the following search terms into Google: ‘ai artists’, ‘artists using AI’, ‘Nederlandse AI kunstenaars’, and ‘Refik Anadol’. Refik Anadol was a onetime search, since it was known he creates with AI, and he is quite famous. There was looked only at the top suggestions of Google, and these criteria were used: 1) the website must have a bio, 2) the website must have some personal work on it, and 3) AI must be mentioned somewhere. Due to the time span of this research, the bar was set at 23 websites.

### Interviews

With the help of the desk research, five in-depth interviews were conducted using a topic list (See Appendix C). The reason for also doing interviews was to gain more

knowledge about the creative work process and how it changed the way art is made. The interview also functioned as a way for artist to share their opinions, experiences, motivations, and details about their work practices. In table 1, the concepts under the loop are stated, and the subcategories that were considered relevant.

**Table 1**

*Operationalization*

| Concepts | Subcategories | Suggestion questions |
|---|---|---|
| **Artificial Intelligence**<br>*a computational system that shows behaviour that would normally be considered intelligent if a human performs the task (Wingström et al., 2022)* | - GANs<br>- Robotics<br>- Neural networks<br>- Deep learning<br>- Etc. | - What kind of technology do you use in your work?<br>- What made you interested in working with this technology? |
| **Creative work process**<br>*A dynamic process consisting out of multiple aspects (Amabile, 1988; Edmonds et al., 2005; Amabile & Pratt, 2016; Wingström et al., 2022)* | - Creativity<br>- Co-creativity<br>- Actor<br>- Outcome<br>- Domain<br>- Space | - How would you define creativity?<br>- What makes something 'art' in your opinion?<br>- Do you have a favourite work you made with this technology? |
| **Art Entrepreneurship**<br>*The systematic practice of art innovation, art market creation, and art value exchange (White, 2021)* | - Art object<br>- Art experience<br>- Art innovation<br>- Artworlds<br>- Art market creation | - Do you feel like people perceive your work different now, because it was made with this technology?<br>- Do you work alone or together?<br>- Would you consider yourself an innovative person? |
| **Reflection**<br>*A reflection on their personal process and possible ethical or other risks that can come with using AI in artmaking* | - Ethics<br>- AI Art<br>- System bias<br>- Future perspectives | - Are there any ethical considerations you make?<br>- What makes something art in your opinion?<br>- How do you see the future of your business/ |

The interviews were approximately one hour and were recorded on the phone or with the recording function of Zoom or Microsoft Teams. A total of four online interviews and one in-person interview were done. Four of those interviews were in Dutch and one of them in

English. In the result section, the quotes are given in Dutch, because this way it felt more personal and true to the respondents.

### Field observation

Lastly, a field observation was done at *Dead End Gallery* in Amsterdam that has the first ever exhibition filled with art made with or by AI. This part was done unstructured, and in the observation the researcher took part as a museum guest. During the visit, paper notes were made while listening to their audio tour that was offered by the museum, and questions were asked to one of the founders of the gallery. With the audio there was hoped to gain more knowledge about what motivated the artist to create with AI, and how they used AI in making the work. After the visit, a report was written and an analysis was done of the notes made during the trip, which will be discussed further in the result section below.

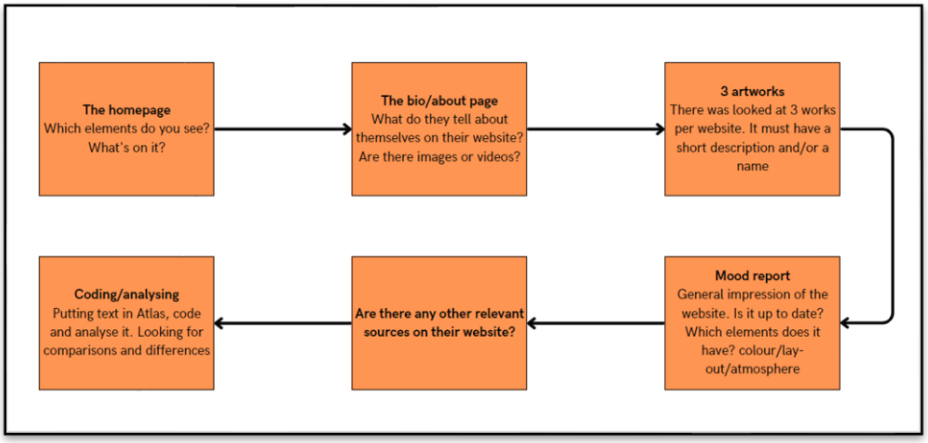
## Data analysis

To analyse the data, an inductive approach was followed (Williams & Moser, 2019). Since not much is known yet about artists who create with AI, this seemed the most applicable. Second, a multimodal and thematic analysis was done by looking at text, images, videos and speech. The first reason for doing this was to link the data with the concepts mentioned in the theory, such as co-creativity and the creative work process and art entrepreneurship. A second reason for doing a thematic analysis was to compare artist with each other by looking for similarities and differences.

To analyse the websites, data was stored in an Excel spreadsheet (see Appendix B). The respondents from the interviews are also included in the website analysis. After gather the data, a step-by-step visualization was made in Canva using the Whiteboard function so information and steps could be retrieved easily. You can click here to see five of the websites that were analysed to get a general impression which route through the website was taken. In figure 6, a visual representation is given of the website analysis process.

**Figure 6**

*Visual representation website analysis*




The interviews were transcribed in Microsoft Word using the transcribe function. Text from the interviews and websites were coded using Atlas.Ti. The coding process was as following; open, axial, and then selective coding to create a theory (Williams & Moser, 2019). With open coding, broad thematic domains were formed. Axial coding was the second level of analysis. In this phase, data was refined, and categorized in more distinct categories. Lastly, by selective coding the codes were selected and integrated into cohesive and meaningful main themes. However, the coding was not a linear process, so there was moved between open, axial, and selective codes. Based on the selective codes, a combined codebook and coding tree was made for both the interviews and the website analysis (see Appendix D & E). The codes that came forward during the interviews, were very similar to the website analysis and were laid out next to each other to see if combining them was possible.

## Ethics & Privacy

Before beginning this research, an ethical checklist was handed in and approved to start. Prior to the interviews, respondents were informed about the topic being studies, the treatment of data in an informed consent form which they read and signed. Data was only shared with the thesis supervisor. Interviews were conducted on a location with no disruptions. Online interviews were done if this was unavoidable or preferred by the participant. Second, before the start of an interview, participants were told again that sensitive information will not be share in the final paper. Names were not replaced by pseudonyms,

because all five gave permission for their name being shared in the paper. During the interviews, participants are allowed to refuse questions, or quit at any given time, and all the stored information of the person will be removed. Lastly, all the information that was gathered during the desk research was publicly available on their personal websites.

# Results & analysis

In this section, the results from the field observation, the website analysis and the interview will be discussed and connected with each other using a multimodal and thematic analysis. During the research, it became clear that artist making art with AI all have their own unique styles and motivations. However, a lot of commonalities were seen as well. Artists making AI art is a relatively small group, but many details were shared on their personal websites, in the interviews and in audio tour. The artists in this research often have multiple professions, with as most often mentioned, teacher, programmer and computer scientist. Lastly, almost everyone had prior knowledge of working with technologies in either their education or previous jobs.

## Field observation at Dead End Gallery

On the 16th of April, a field observation was done at the *Dead End Gallery* in Amsterdam to watch their newest exhibition, '*An Immaterial Force; Searching for the Soul in AI*'. *Dead End Gallery* is the first ever gallery in the world that if fully dedicated to AI and they call their gallery 'the beginning of a new era' (Dead End Gallery, n.d.). In this observation, the researcher took part as a visitor to the museum. When arriving, the co-founder Constant Brinkman offered an audio tour that went through all the artworks that were shown there. In this analysis, the focus lies on this audio tour since these were made together with the artists. The audio tour provided information about what motivated and inspired the artist to make it with AI and what the story is that is depicted in the artwork.

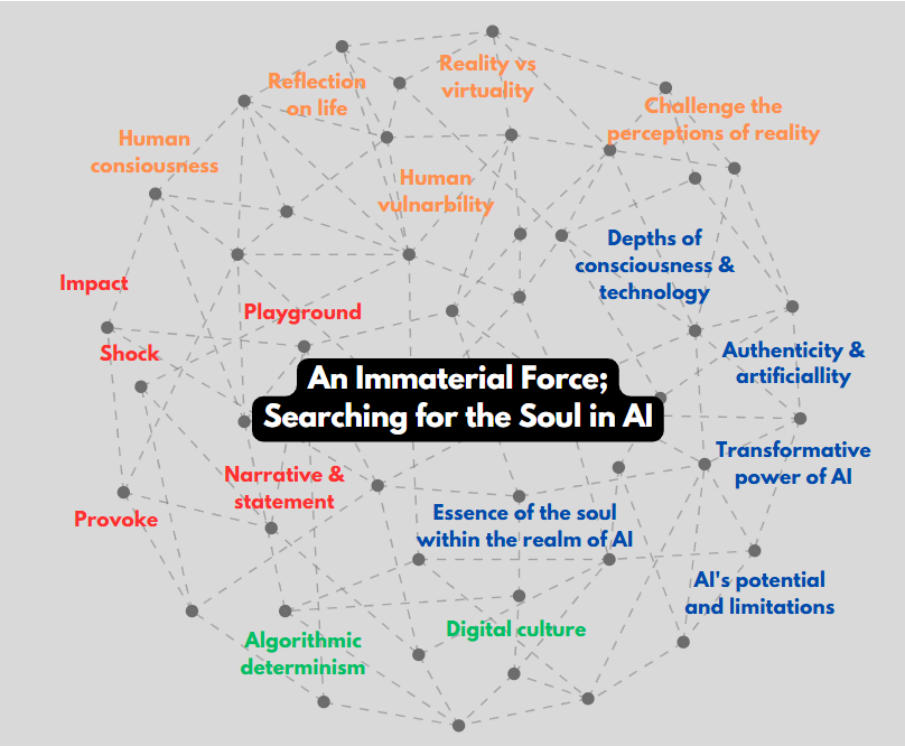
Prior to the start of the audio tour, a small welcome word was done by the co-founder Constant Brinkman, -known for his knowledge about the intersection between AI and creativity. Most of the work, hanging in the gallery were made by human artists. However, Constant told that some artworks were made by an AI artist, which meant that there was no real person made of flesh and blood involved in the making of the actual work. In the gallery, they do not call them 'AI artists' anymore, but real artists. This quite surprising comment

captures the idea that the way art is being made is changing and that AI is diffusing the lines of art and creativity (Coekelbergh, 2017). The idea of human creativity is also put into a different perspective.

During the audio tour, many notes were taken that captured the themes and stories that the creators tried to tell with their work. The name of the exhibition '*An Immaterial Force; Searching for the Soul in AI'* is interpreted as a way of how AI can have human traits, such as a soul and be creative. To capture this idea of how AI is a new 'immaterial force' a word cloud was made of words that stood out during the observation (see figure 7). It was decided to make a word cloud, because it shows how the different keywords are connected to each other and to the main theme of the exhibition. The words are clustered in four colours, which means that these artists had similar motivation and inspiration. These words showed something about the relationship between the artist and the AI, and their motivations of creating with AI.

**Figure 7**

*Keywords word cloud based on the audio tour.*




The red keywords said something about the type of reaction the artists wanted to make with their art. These words are supported by the ideas about novelty as mentioned in the literature (Boden, 1998, Chamberlain et al., 2018; Demmer et al., 2023). An essential aspect

for artists is creating something that gives a certain reaction to people. Green words say something about the current digital society we live in and that algorithms shape our world. The blue keywords can be connected to the green words as well. For all the artists in the gallery, making art with AI is not only a way to address the current society, but also a way to explore with new technologies such as AI. Artists look at the challenges and possibilities of AI and try to question it, by looking at AI whether can be creative and have a soul indeed. Next, several artists questioned the ideas of authenticity and originality in their works, which is in line with not only the theory, but also with the interviews and the website analysis.

The orange words can relate to the human minds. What is meant by this, is that artists try to explore the boundaries of our physical world and what it means to be human. In conclusion, the artist who had work hanging in the gallery tried to address how AI is being integrated into our digital and physical lives, but also how it is influencing us. One artist calls the adaptation of AI in his work as a 'playground', which suggest that AI is an adaption to the toolbox. In the next sections of the analysis, there can be seen that the words represented in the word cloud also came back in both the websites and interview analysis.

## Personal website analysis

During the analysis of the websites, there was looked at how artist present their work in relation to AI online. There was also looked at how they create with AI. The number of details being shared by artists about the work process behind differentiated a lot and was divided into three categories: long, middle, and short descriptions. Seven artists had long description, four middle length descriptions, and eight people had relatively short descriptions. This created some form of transparency about how they have used AI in the creative work process. For some artists, there was no description of the steps taken at all. This is interesting because, according to Cetinic and She (2022), sharing details of the work process is actually a very important reason why people are being negative towards creating with AI. The following four themes will be discussed in the rest of this section: the artist profile, the creative work process, the toolbox, and the motivations.

### Artist profile

A total of 23 personal websites were analysed to see how they present their work in relation to AI and to see how making art has changed due to AI. Overall, the artists in this sample are diverse, but a commonality is that they all possess multiple professions. Most

often they had two or more profession, such as programmer, engineer, researcher or teacher. This shows that these people who are creating with AI all have technological skills and knowledge about the topic. Another big part of the artists portfolio is that they do collaborations with other people. Not only artists, but also people in other professions. This shows that creating with AI also enables new forms of collaboration not only with the technology, but also with other people.

Next, the concept of Art Entrepreneurship (White, 2021) was often perceived on the websites. Everyone in the sample is international, in the sense that they have done collaborations all over the world or have done exhibitions in another country. This helps with the development of new artworlds, by collaborating with others, sharing work internationally, and by presenting their work online. Another important aspect for many of the artist was interacting with viewers. This way visitors could see how the technology works and interact with it. For example, for artists such as Karl Sims, Anna Ridler, and Laura Lee McCharty and Sarah Meyohas making a connection with viewers through their medium was an essential part of their creative work process. Sarah Meyohas said for example that because of making art with technology artists are not "limited by their geography" anymore. By making art with new technologies such as AI, "people around the world who simply have an engagement with your work […] can just see it online" (Sarah Meyohas).

### The creative work process

As mentioned above, the number of details about the creative work process shared on the website differed per person. Some artists provided incredibly detailed descriptions, images and videos. Others had noticeably short descriptions with not much detail. Based on the mood reports, there could be concluded that some artists kept their websites very up-to-date and share much work and details on it. Others did not share much information on their website. A reason for this could be is that they are busier with their other profession or they simple prefer other communication platforms than their website.

The notion of co-creativity was perceived a lot on the websites. Creating with technologies is seen as a collaboration or sometimes even as a relationship. McCharty captures this idea of co-creativity in the following quote:

> “I am embodying machines, trying to understand that distance between the algorithm and myself, the distance between others and me.”
>
> ~ Laura Lee McCharty

Not only for Laura, but for almost every artist creating with new technologies it is a way of exploring themselves, the technologies, and their relationships with others. So, reflecting on their own creativity and how it is to be human. Sougwen Chung adds to this statement by saying:

> “When do we start to see that the systems we build are actually us in another form.”
>
> ~Sougwen Chung

Chung is an artist who creates with robotics, and on her website, for instance, she has many images and videos of her creating art with her robot. This is an example of how artist and AI are co-creating and being co-creative. She is a good example, because she shared many details on her website, she was transparent about the tools she used, and you could see her working with the technology. This was also the case for some other artist who gave descriptions of their works process. This gave some form of clarity, transparency, and proved that there is still human input in the creative work process.

### The toolbox

With the rise of AI in artmaking, the toolbox for artists has become bigger. Technology offers new materials and ways of making for artists to explore. All the artists made use of AI or a subcategory of it. What was interesting to see is that most of them also combine these digital tools with physical tools, such as drawing, painting, sculptures and other tools. For example, Alexander Reben created a series of artworks “*dreamed up*” by AI, and afterwards a real-life artwork was produced by the artists and others. Below, you can see two more examples of the combination of digital with physical.

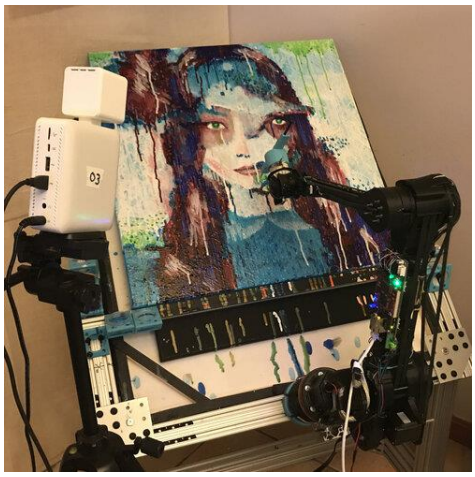


**Figure 7**

Robot from Pindar Arman

**Figure 8**

Soughwen Chung painting with her robot

## AI Art

On the websites, the artist regularly shared their views and uptakes on technology and creating with it. For a lot of them, technology is an adventurous thing. It is a way of enhancing their own artistic and creative practices. Memo Akten said the following thing about it:

> "One crucial aspect of these systems that I've always been very interested in, is exploring interactive, realtime, computational systems to enhance artistic, creative expression."
>
> ~ Memo Akten

For instance, making use of machine learning is being used to "*explore novel applications for creating art*" by Scott Eaton. However, not only for him this was important. For everyone technology is a way of creating new novelties and addressing questions or topics that drive them. Therefore, the work presented on their websites shows that there is a novelty created when making the artwork. Most artists also provided a description of what the work is about, which shows what the story of the work is. This will be discussed in more detail below.

## Motivations

In this part, the motivations why artists create with AI and other technologies. These motivations and inspirations were divided into five categories: societal, scientific,

technological, natural, human life, and knowledge sharing. The reason many artists make art in the first place is because they want to address a certain topic and share their thoughts and opinions on the matter.

For several artists, addressing and critiquing societal issues was an important part of their work and why they wanted to co-create with AI. A characteristic of art is that it conveys a message, it gives a certain reaction, and tells a certain story. Themes often addressed where culture, history, race, privacy, agency, and other existing social systems. Besides addressing societal topics, questioning the technology and the direction it is going in were also seen as important. By creating art with AI, they also questioned the technology at hand. The following quote illustrated the combination of addressing societal and technological themes:

> "Central to my work is a critique of the simultaneous technological and social systems we are building around ourselves. What are the rules, what happens when we introduce glitches?"
>
> ~Laura Lee McCharty

This quote illustrates that AI is not only a new tool to be used but also a new way of expressing concerns and share opinions that matter to the artist.

For artists with academic backgrounds in technology or computer science, exploring with AI was interesting for them. For instance, for Gene Kogan, it helped him formulate theory, applications, and critical issues that can come forward when creating with technology. He says the following thing about machine learning:

> "This excites me because it gives us a way to study those most mysterious questions that science has been impotent to tackle so far."
>
> ~Gene Kogan

To build further on the scientific interests, all the artists creating with AI technologies have a big interest in technology in general. It gives them a better understanding of themselves, the technology, and the things surrounding them. As mentioned before, AI is not only a way of addressing societal issues, but also a way of questioning the challenges and

possibilities of the technology. For example, the following quote is being made about Sofia Crespo:

> "Her work brings into question the potential of AI in artistic practice and its ability to reshape our understandings of creativity. On the side, she is also hugely concerned with the dynamic change in the role of the artists working with machine learning techniques."
>
> ~Sofia Crespo

This quote illustrates that artists us AI to question not only the technology itself, but also their role as artist. Second, several artists mentioned that they are aware of the ethical issues that can come forward when creating with technology. It seems that several artists also see it as their role as an artist to express these ethical problems, and that what they are doing is ethical. Also, the idea of computational creativity is something that received attention of several artists. Both Pindar van Arman and Mario Klingemann think that it is interesting to see how AI can show "*almost autonomous creative behaviour*". Something that Boden (1998) would say is not possible. The overarching reason everyone creates with AI is because they like exploring and experimenting with it.

Another big motivator for artists was topics surrounding nature, such as climate change, natural history, and flora and fauna. AI has offered artists new ways of visualizing natural life and let people engage with nature through using technology. For example, Refik Anadol made a sound and video experience using big algorithm sets (see figure 9). AI allows viewers to make a connection between AI and the natural world we live in. Jeroen van der Most argues that "*AI can deeper relationships with nature*". This seemed to be an important driving force for many more artists, such as Mark IJzerman, Anna Ridler, Memo Akten, Sofia Crespo and Soughwen Chung.

**Figure 9**

*Echoes of the Earth: Living Archive (Refik Anadol, 2024)*

This idea of connecting digital technologies, such as AI, to the natural world shows that even though we are becoming more digital, artists still try to keep their foot in the physical world by interacting and addressing these topics.

As mentioned before, using AI in the creative work process is not only for exploring the technology, but also for exploring the human conditions. With making art, artist try to address the questions if AI can indeed be creative and original. This quote of Memo Akten covers this statement:

> "I work with emerging technologies thinking of these technologies as extensions of our body as extensions of our mind. Thinking about their impact on us as individuals, how we behave and express ourselves and ultimately their impact on culture, ethics, law, tradition, ritual and religion."
>
> ~ Memo Akten

This quote is also aligned with the motivators about the usage of AI in the creative work process as a way of addressing the impact of technology in our physical world.

Lastly, the integration of AI in the creative work process is also a new way of knowledge sharing. Artists try to speak to people through their art by telling a story about the things that moves and concerns them. Many of the artist are active in educating others on new technologies such as AI. Others speak about these topics at conferences or in lectures. Lastly, many of the artist try to stimulate critical thinking by making interactive work so people can interact with the technology and think about the topics that are being addressed in the

artwork.

Based on the website analysis, there can be concluded that artists working with AI in their creative work process have a lot of knowledge about technical topics. Artists do not only make art, but also want to address societal, natural, and/or technological topics in their work. This aligns well with the word cloud from the audio tour. In general, there is a big interest for new technologies such as AI in this group. So, AI is not mere a new medium in the toolbox, but it is also a new platform for artist through which artist can speak, create new art experiences, and share their knowledge with others.

## Interviews

In the website analysis, it became clear that artist see AI as an extension to their toolbox, and that working together with AI is a collaboration and being co-creative. In this section, the insights from five in-depth interviews will be described. There was spoken with Noortje Stortelder, artist and teacher, Bas Uterwijk, a post-photographer, Bas Waijers, a designer and AI hobbyist, Mark IJzerman, interdisciplinary artist and teacher, and Pindar Van Arman, who made a robot arm. What these five people have in common is that they all make use of AI or similar technologies. Second, they all combined AI with other equipment from the toolbox, such as painting, drawing or sculpting. Mark IJzerman captures this essence well in the following quote: *"Technologie is mijn schildersezel en kwast."* This quote illustrates this idea of collaborating with technology and using AI as a new medium to make art.

In the interviews, artists could give a more detailed description of their creative work process then on their website. Also, more details about ethical considerations, key features of AI art, meaning of art and creativity were given. In this section, the most relevant and surprising insights that were not seen in the website analysis will be analysed.

### Creative work process

During the interviews, the artists addressed explicitly that they are still a big part of the creative work process, and that not only the technology is making the product. The following quote by Bas Uterwijk illustrates this idea of collaborating with the technology:

> “Het is een collaboratief werk. Ik werk samen met een machine, samen met een algoritme. Het is niet zo dat ik het helemaal uit mezelf haal. Ik maak constant gebruik van het programma wat mij een heleboel feedback geeft.”
>
> ~Bas Uterwijk

This quote shows that working with AI is really seen as a collaboration, and that there is still involvement from the artists. It shows the relation between the AI and the artists, and that AI can give surprising input and feedback in the creative work process. A critique in the media is often that AI can’t be creative or original, but the respondents tried to say otherwise. During the interviews, artists were asked what creativity means to them. For example, for Mark and Bas Uterwijk being creative is combining unexpected things with each other. Things you normally do not expect to see together. While for Bas Waijer and Noortje, being creative is the ability to come up with new ideas, being creative, and innovative. However, for Bas Waijers and Noortje, the most important thing about creativity was the freedom of expression for them and being able to tell a story with their artwork. What Pindar adds to the meaning of creativity is that creativity is about creative problem-solving, and that it is something that just comes and goes. The following quote shows this idea:

> “I would define creativity anytime you solve a problem withing using brute force.”
>
> ~ Pindar van Arman

This quote can be connected to both statements about innovation and creativity. It shows that to be creative you also need to be innovative in some sort of way, and that taking the effortless way is not always creative. For the artists, innovation meant coming up with new concept and making new things. For Bas Waijers, conceptual thinking was his power and his ability to think about something no one else would do it. In general, AI did not really change their personal view on creativity. However, it did made them more critical about their creative work process, because of using technologies in it.

These different meanings confirm the notion that the creative process is no clear process, and that creativity means different things to people and that it can also be connected to innovation. Several artists said that AI art generators are not original and creative, because

these systems copy things, and a lot of those work look like each other's. For them making art in the first place is making something "*beautiful, interesting, and daring*", and being able to create an emotional response to others. Another reason for them that generative AI is not always creative and original is simply because they cannot have these same deliberate intensions as artist do. Therefore this bias towards AI generated art is seen in the reactions from the respondents as well (Moffat & Kelly, 2006; Chamberlain et al., 2018; Demmer et al., 2023).

All these example shows that innovation and art entrepreneurship is a concept applicable to artists, because they constantly must make something new, and do something that has never been done before (White, 2021). For both Mark and Noortje, trying new technologies and keeping up to data was also a way of being innovative for them. Noortje said the following thing about that:

> "Ja ik ben niet bang om nieuwe dingen aan te gaan en eigenlijk nou ja, naast niet bang, maar zelfs soort van geïnspireerd en ik omarm die dingen die er zijn."
>
> ~Noortje Stortelder

This quote illustrates this idea that artists embrace the technology and that it allows them to be more creative and innovative. Especially in the age of generative AI, were making art becomes easier for everyone who want to try making art, this was an important reason for them.

For creating with AI, thinking of ethical aspects is becoming more important for artists. All the respondents kept these ethics in mind by being aware of the things they did in their work process. For instance, all the artists gather their own data or image material. Both Bas Uterwijk and Noortje mentioned that they do not put names of others in their prompts. Mark mentioned that in his interactive work were viewers can engage with the technology, he must make the AI in such a way that it cannot discriminate or be biased. Another ethical issue that came forward it that some technologies are not particularly good for the climate, because they take up a lot of energy. So, both Mark and Bas Uterwijk tended to avoid using that type of technologies. All these examples illustrate that artists are aware of these ethical issues and that they try to keep them in mind when creating art.

## AI Art

Indirectly, all the respondents tried to prove that the work they are making is called art, because they are still the main contributor in the work. They are aware about the issues surrounding AI art about novelty, originality, and copyright. For instance, Pindar his opinion was that we cannot call AI an artist. It can make art, but it will never be an artist according to him. This is illustrated in the following quote:

> "It's a question of the big controversy is whether AI can be an artist, and I don't even think that's a controversy because I'll give you my opinion. AI can be creative. Absolutely. Can it be an artist? Absolutely not. […] To make art, you have to be a person, and art is basically the communication of one person to another, and it can be anything I like."
>
> ~Pindar van Arman

This quote illustrates that the questions surrounding novelty and originality have become more important to think about for artists. Also, Mark mentioned this idea that because making art with AI has become easier, it creates a lot of the same things for users. According to him that is less creative, because there is less flexibility in it. During the interviews, several important aspects were mentioned about whether AI art can be called art. According to the artist, work can only be called art if it is able to create an emotional response, make aware decisions, make a statement, and if it is original. The artists are all critical about AI, because they see that it is hard to make original art with the usage of programs such as Midjourney or Dall-E, because a lot of things are the same or look like something that is already made. So, for them it is important to make something that is new, and that no one has seen before. Also, exploring with AI was also a way of questioning the technology and exploring with it to see if it indeed can be creative.

## Motivations

In the interviews, the respondents talked some more about what inspires and motivates them to create with AI. All the five persons had unique styles and sources of inspirations. Bas Waijers captures this essence in this quote: "*Ik heb in het verleden altijd gezegd dat inspiratie kan overal vandaan komen*". Pindar also agreed with this statement.

The driving force for artist is making work that inspires not only other but also themselves. It is a way of sharing their interest and conveying their emotions in a piece of art. In the interviews, the different motivations could also be categorised in societal, technological, natural, human life, and knowledge sharing. Especially for Mark, addressing current societal and ecological problems is his big motivator. He tries to address ecological topic in his work, by also questioning the technology. According to him there is a "friction between ecology and technology" and that is something that excites him and that he wants to question. On the other side, for Bas Uterwijk, AI allowed him to study cultures and humans. For Bas Waijers, creating with AI was more a hobby than him, and earning money was not his goal. For him it was more about experimenting and conveying a story.

Questioning the technology and experimenting with AI was for all the respondents a motivator to try technology in the first place. Bas Uterwijk made the following comment about it: "*Maar AI dat bestaat nog maar echt heel kort, dus dat is...ja dan voel je beetje als een ontdekkingsreiziger dat je echt onontgonnen terrein kan ontdekken en dat is tegenwoordig best wel bijzonder, want alles is al gedaan".* AI and other technologies have a big impact on our current society, and also Noortje really felt that it is her place as an artist to explore these technologies and tell other about it through her work.

> "ja nou, ik vind wel dat [..] er wordt best wel veel negatief gesproken over digitale middelen of het überhaupt kunst is, digitale kunst, en ik ben niet bang om te zeggen dat ik AI gebruik. En ik ben ook niet bang om dat gesprek aan te gaan, juist omdat ik een kunstenaar ben."
>
> ~ Noortje Stortelder

This quote addresses this idea, that artist see it as their role to explore where technology is going in the future. Overall, the respondents had a lot of technological motivations for working with AI. For all of them, there is a big enthusiasm and curiosity in AI. According to Bas Waijers, AI enables him to make something that people have not seen that much before. Not only to Bas, but also for Mark, AI gives them the opportunity to give non-human things a voice and to create things that cannot exist in the real world. These things align with the words from the word cloud from the field observation.

Something that stood out, was that Pindar van Arman is the only respondent using

robotics in his work. For him, a difference between AI and robotics, is that robots are a physical embodiment of AI. For him, the robot reflects himself and his creativity.

> "Every time I make it reflect. I'm trying to build it in my own image. To build it in the image of my creativity, to build it, to be creative like me, but from a machine's perspective."
>
> ~Pindar Van Arman

This quote illustrates this question about whether AI can be creative or not. He was very intrigued about making a digital copy of himself with his robot and making it a reflection of himself. What was also surprising, is that the main reason for making his robot arm was so he could spend more time with his family. So, in some way, AI allowed him to be more efficient, and have more family time.

Overall, there can be said that the respondents had different sources of inspiration, but many of them had the same reasons for why they create with AI. On the one side, technology is a new medium to convey their stories and topics of interest. On the other side, using technology is a way of questioning, exploring, and experimenting with the technology.

## Discussion & Conclusion

In this research, a multi method study was conducted about how AI has changed the way we make art. A total of 23 personal artist websites were analysed, five in-depth interviews were conducted, and one field observation was done at *Dead End Gallery* in Amsterdam. Using a multidisciplinary lens, a multimodal and thematic analysis of the data was done to answer the following research question:

*How has AI changed the way we make art?*

With the following two sub questions:

*How do artists present their creative work process in relation to AI?*

*What motivates artists to integrate AI in their creative work process?*

AI has changed artmaking in such a way that it is really seen as an extension to the toolbox of the already existing ways of making art. Artists making AI art have a big interest

for these new technologies and are eager to explore and experiment with them. Another way how it has changed the creative work process, is that it gave artists the opportunity to create new forms or art experience, new type of interaction with viewers, and explore the boundaries of their own creativity. For the respondents in the interviews, their creative work process has changed in such a way that it allowed them to make new things, be more efficient sometimes, and one person said that it allowed him to have more family time what was surprising. However, the respondent did say that it can take a lot of time sometimes to get the right thing you want. So, working with AI can be quite hard as well. Especially in the time of generative AI were everyone can explore with new AI tools.

The results also confirm this idea of co-creativity (Davis, 2013; Wingström et al., 2021, Demmer et al., 2023; Nordström et al., 2023). When there are co-creativity artists mix their skills with the skills of the technology. Artists really saw making art as a collaboration with the technology. Therefore, the role/activity matrix from Demmer et al. (2005) is very suitable for AI art. Often there was no full partnership with AI, but most often AI was mere an assistant or was it a partnership between the artists and the AI. With AI as an assistant, the artists still come up with the idea, the AI helps with making it, but the artist evaluates and finetunes the end product. Whereas in a partnership with AI, the artist is in full control, but they really create together.

Another way how AI has changed artmaking is that it motivated new collaborations (Edmonds et al., 2005; Fauchart et al., 2022). Many of the artist discussed in this paper did collaborations with other artists , but also with people from other disciplines. These findings support the concept of Art Entrepreneurship by White (2021). AI has allowed artists to introduce, diffuse and spread their work in new ways all around the world. Also, by creating with AI they wanted to share their knowledge about the technology and topics important to them. Second, these new art innovations, helped with the shaping of a new artworld where AI art is becoming more accepted (White, 2021; Nordström et al., 2023).

On the personal websites, artists are transparent about their usage of AI. They present their creative work process by sharing details about in the artwork description. However, some people did have no description at all, some had short step-by-step instructions, while others had long descriptions of everything they did. So, making art with AI did not only change what kind of art artists make, but also how they talk about their works. Cetinic and She (2022) argued a reason people are so negative towards AI art is because artists do not

share details about their work process. This results from all the data actually suggest that artists do share many details about their creative work process, and that it has become more important to them. Especially in this digital age we live in.

The results also showed that especially in the age of AI, questions about originality and novelty are becoming more important to artists (Boden, 1988, Chamberlain et al., 2018; Demmer et al., 2023). Artists did try to tell a story and have an emotional engagement with viewers (Demmer et al., 2023). It seems that because of the usage of AI, artists are more aware that they must talk about their artworks and be transparent about it.

Even though all the artists had their unique style, they did have similar motivations on why they want to use AI. First, AI is a new medium which they can use to share their opinions and viewpoint. In total, five type of motivations could be distinguished: societal, scientific, technological, natural, human, life, and knowledge sharing motivations. What all these artists have in common is that they use AI to express these motivations in art. AI changed art in such a way that artists started exploring their own creativity even more. It rises question about what it means to be creative, and how they can be more creative in this age. Thus, AI art can really be seen as a new socio-technical system (Caramiaux, 2020; Siemon et al., 2022). The results really suggest new type of interactions between people, the creative work process, and technology.

However, something that did became clear during the website analysis is that not all the artists websites are very up to date. Therefore, it is hard to look at how artists are currently thinking about the usage of AI in their creative work process. On the other hand, this can suggest that they are more active on other platforms, such as social media. This is something worth studying in future research. Another thing that was noticeable is that almost every artist had prior educational or professional experience in working with technology. This is important to know when looking at this group people. Lastly, the group of artists making AI is still relatively small and new. More artists are now exploring and experimenting with art, but people might simply not know about them. Therefore, the details shared about the creative work process of artists are still limited. For future research it is recommended to do more interviews and field observations. Next it is also worth studying other platforms than websites to see how active artists are on other media platforms.

This research aimed to shed more light on artists who integrate AI into their creative work process. For policymakers it is worth looking more at this new stream of art and to

create more awareness about the usage of AI in the art and culture sector. First, artists can help sharing knowledge about new technologies with others through art experiences using AI. Second, since creating with AI is a new art style that is coming up it is important for policymakers to give this group more attention especially if it comes to giving funds to artists and legitimizing them as real artists.

The integration of AI in the creative work process functions as a new add to the toolbox for artists. It gave them the opportunity to explore and experiment with AI, but also to try new forms of creating, combine art styles and tools, but also engage with others in new ways. Next, it has created new forms of collaboration in the creative work process not only with AI, but also with people from other disciplines. Artists are very much aware about issues concerning novelty, ethics, and originality, and they try to tackle these problems in their work. Lastly, AI has helped artists not addressing only topics that interest them, but it also allowed them the technology they are using at the first place. AI Art is most likely becoming the next big art stream and therefore it deserves more attention. That is why this paper will end with one last quote:

> “kunst van deze tijd is voor een heel groot deel digitale en generatieve kunst […] als onze kinderen later terugkijken dan zeggen ze van dat was gewoon in de kunst één van de grootste stromingen.”
>
> ~Bas Uterwijk

# Bibliography

Ai-Da (2019). *Who is Ai-Da?* Ai-Da. https://www.ai-darobot.com/about

Amabile. T. M (1988). A Model of Creativity and Innovation in Organizations. *Research in Organizational Behaviour*, vol.10, p. 123-167.

Amabile., T. M. & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. *Research in Organizational Behavior* 36 (2016) 157–18, http://dx.doi.org/10.1016/j.riob.2016.10.001

Boden, M. A. (1998). Creativity and artificial intelligence. Artificial intelligence. 103, p.347-356, SOOO4-3702(98)00055- 1

Carabal-Montagud, M., Santamarina-Campos, V., O'Brien, G., & De-Miguel-Molina, M. (2018). Successful cases of the use of innovative tools and technology in the creative industries field. In *Drones and the Creative Industry* (pp. 69–81). https://doi.org/10.1007/978-3-319-95261-1_5

Cetinic, E. & She, J. (2022). Understanding and Creating Art with AI: Review and Outlook. *ACM Trans. Multimedia Comput. Commun*. Appl. 18, 2, Article 66 (February 2022), 22 pages. https://doi.org/10.1145/3475799

Chamberlain, R., Mullin, C., Scheerlink, B. & Wagemans, J. (2018). Putting the Art if Artificial: Aesthetic Responses to Computer-Generated Art. *Phsycology of Aesthetics, Creativity, and the Arts,* Vol.12(2), p.177-192. http://dx.doi.org/10.1037/aca0000136

Ciarli, T., Kenney, M., Massini, S. & Piscitello, L. (2021). Digital technologies, innovation, and skills: Emerging trajectories and challenges. *Research Policy,* 50, https://doi.org/10.1016/j.respol.2021.104289

Coeckelberg, M. (2017). Can Machines Create Art? *Philosophy & Technology* (30), p.285:303, DOI 10.1007/s13347-016-0231-5

Davis, N. (2013). Human-Computer Co-Creativity: Blending Human and Computational Creativity.

Demmer, T. R., Kühnapfel, C., Fingerhut, J., & Pelowski, M. (2023). Does an emotional connection to art really require a human artist? Emotion and intentionality responses to AI- versus human-created art and impact on aesthetic experience. *Computers in Human Behavior*, *148*, 107875. https://doi.org/10.1016/j.chb.2023.107875

Moffat, D., & Kelly, M. (2006). An investigation into people's bias against computational creativity in music composition. Paper presented at *The Third Joint Workshop on Computational Creativity* (ECAI'06), Riva del Garda, Italy

Nordström, P., Lundman, R. & Hautala, J. (2023) Evolving Coagency between Artists and AI in the Spatial Cocreative Process of Artmaking, *Annals of the American Association of Geographers*, 113:9, 2203-2218, DOI: 10.1080/24694452.2023.221064

Siemon, D., Strohmann, T., & Michalke, S. (2022). Creative Potential through Artificial Intelligence: Recommendations for Improving Corporate and Entrepreneurial Innovation Activities. *Communications of the Association for Information Systems*, 50, 241-260. https://doi. org/10.17705/1CAIS.0500

Townsend, D.M. & Hunt, R.A. (2019). Entrepreneurial action, creativity, & judgment in the age of artificial intelligence, *Journal of Business Venturing Insights*, 11, https://doi.org/10.1016/j.jbvi.2019.e00126

White, J. C. (2021). A Theory of Why Arts Entrepreneurship Matters. *Journal of Arts Entrepreneurship Education*: Vol. 3: Iss. 2, Article 2, https://doi.org/10.46776/jaee.v3.65

Williams, M., & Moser, T. (2019). The art of coding and thematic exploration in qualitative research. *International Management Review*, *15*(1), 45. https://www.questia.com/library/journal/1P4-2210886420/the-art-of-coding-and-thematic-exploration-in-qualitative

Wingström, R., Hautala, J. & Lundman, R. (2022). Redefining Creativity in the Era of AI? Perspectives of Computer Scientists and New Media Artists, *Creativity Research Journal*, DOI: 10.1080/10400419.2022.2107850

# Appendix A: Flyer

# Appendix B: Topic list

*Introduction*

First, thank you for joining me today in this interview. Before we start with the interview, I will tell you a bit more about the goal of my study. The purpose of my study is to explore how artists experience the influence of Artificial Intelligence, Extended Reality, or other emergent technologies in their creative work. To be more specifically, how it changed their work process, and their meaning of creativity. The reason for choosing this topic was to gain more insight into why and how people use new technology in the creative industry.

Also, a bit of formality, this interview is approximately 1 hour, and will be recorded. Are you still okay with that? And do you have any questions beforehand?

| Topic | Themes | Suggestion questions |
|---|---|---|
| **Introduction** | • Artist description<br>• Artist style<br>• Background<br>• Work process.<br>• Inspiration | • Could you tell me a bit more about yourself?<br>• What is your work background?<br>• How would you describe your art style?<br>• Where do you get you get your inspiration from? |
| **Artificial Intelligence** | • Artificial Intelligence<br>• Similar technologies | • What kind of technology do you use in your work?<br>• How would you describe this technology to someone who has no idea how it works?<br>• What made you interested in working with this specific technology? |
| **Creativity** | • Process<br>• Creativity<br>• Creation<br>• Value<br>• Actor<br>• Domain<br>• Space | • How would you define creativity?<br>• What makes something ‘art’ in your opinion?<br>• Could you describe one of your works and how you used [this technology] in that?<br>• Do you have a favourite work you made with [this technology]?<br>• How did your creative process change due to these new technologies? |
| **Art entrepreneurship** | • Art object<br>• Art experience<br>• Art innovation<br>• Artworlds<br>• Art market creation | • What motivated you to try and experiment with this [technology]?<br>• Do you feel like people perceive your work different now, because it was made with [this technology]?<br>• Do you work together or alone?<br>• Would you consider yourself an innovative person and why? |
| **Reflection** | • Ethical aspects<br>• Future perspective | • Are there any ethical considerations you make when working with [this technology]?<br>• How do you see the future of your business?<br>• Would you like to try any new technological materials in the future? If so, which one?<br>• Is there anything you would have done differently? |
| **Fun end question: Do you think it is important for all artists to explore with new technologies and why?**<br>**If you could give 1 tip to future artists. What would it be? Is there any topic we haven’t discussed that you still want to talk about?** | | |
| **Do you have any final comments?** | | |

# Appendix C: General characteristics personal websites

| Name | Technologies & other tools they use | Search term | Visit date | Nationality | Educational background |
|---|---|---|---|---|---|
| Alexander Reben | AI; automation technologies; generative technologies | ai artists | 5-6-2024 | US | MSc in Media Arts & Sciences; BSc of Science in Applied Math |
| Anna Ridler | collection of information; data; datasets; AI; algorithms | Artists using AI | 24-4-2024 | UK | English Literature and Language; Information Experience Design, Royal College of Art; fellowships at the Creative Computing Institute at University of the Arts London (UAL) |
| Bas Uterwijk | photography; post-photography; generative adversarial networks (deep learning, AI based software) | Artists using AI | 24-4-2024 | NL | Special effects, 3D animation, videogames & photography |
| Bas Waijers | Photoshop & illustration software; figma; AI | Dead End Gallery | 9-6-2024 | NL | Art school |
| Gene Kogan | generative AI; collective intelligence; autonomous systems; computer science | Artists using AI | 24-4-2024 | US | Computer science, programming |
| Helena Sarin | generative adversarial networks | Artists using AI | 24-4-2024 | RUS | Visual artist & software engineering |
| Jake Elwes | AI; algorithms, generative AI; moving-image installations, sound and performance | Artists using AI | 23-4-2024 | UK | Fine Arts |
| Jenna Sutela | biological and computational systems; artificial neural networks; human microbiome | ai artists | 5-6-2024 | FIN | Not mentioned on website |
| Jeroen van der Most | Data; algorithms; AI; quantum computing; NFTs | Nederlandse AI kunstenaar | 9-6-2024 | NL | Not mentioned on website |

| | | | | | |
|---|---|---|---|---|---|
| **Karl Sims** | AI; automation technologies; generative technologies; moving installations and probably more | ai artists | 5-6-2024 | US | Computer Graphics MIT |
| **Laura Lee McCarthy** | AI; algorithms, moving-image installations, sound and performance | ai artists | 5-6-2024 | US | BS computer Science & BS Art and Design |
| **Mario Klingemann** | neural networks, code, and algorithms, and AI | Artists using AI | 24-4-2024 | DU | copywriter, graphic designer, self-taught programmer |
| **Mark IJzerman** | algorithms; AI; video; installations and other digital tools | name recieved during interview | 14-6-2024 | NL | Ecology futures |
| **Memo Akten** | AI; big data; deep neural networks (aka AI); software algorithms | Artists using AI | 22-4-2024 | TR | PhD in AI - deep learning- and expressive human-machine interaction |
| Noortje Stortelder | AI; animation; photography; sculptures | name recieved during interview | 14-6-2024 | NL | |
| Pindar Van Arman | Robotics, Artificial Intelligence, and Quantum Computers | Artists using AI | 24-4-2024 | US | |
| **Refik Anadol** | AI; machine learning; NFTs | Refik Anadol | 23-4-2024 | TR | Machine learning; Fine Arts |
| **Sarah Meyohas** | automation; AI; VR; AR | ai artists | 5-6-2024 | FR - US | Dual degree in Finance and International Relations |
| **Scott Eaton** | AI; data; computer graphics and animation --> with drawing, photography, anatomy and sculpture | ai artists | 5-6-2024 | US | MIT, academic drawing and sculpture and MA in Art |
| **Sofia Crespo** | biology inspired technologies; AI; neural networks | ai artists | 5-6-2024 | AS | Computer Science; Art Direction; Literature and Philosophy |
| **Sougwen Chung** | Robotics; AI; computer systems; painting; drawing; VR and more | Artists using AI | 22-4-2024 | CA-CN | BSc Fine Arts; MSc Interactive Art; Researcher MIT media lab; PhD computational Media Arts |
| Stephanie Dinkins | AI; robotics; immersive installations; algorithms | ai artists | 5-6-2024 | US | art school & photography |

| | | | | | |
|---|---|---|---|---|---|
| Trevor Paglen | ai; algorithms; photography and more | ai artists | 5-6-2024 | US | BS desgree, Master of Fine Art, PhD in geography |

# Appendix D: Codebook

| Open codes | Axial Codes | Selective Codes |
|---|---|---|
| - Artist<br>- Programmer<br>- Researcher<br>- Software developer<br>- Engineers<br>- Hobbyist<br>- Teacher | Professions | **Artist profile** |
| - Collaborations<br>- Interaction with viewers<br>- Internationally known.<br>- Active social media<br>- Artworlds | Art Entrepreneurship | |
| - Being innovative<br>- Combining unexpected things<br>- Connectedness<br>- Curiosity<br>- Freedom of expression<br>- Forward thinking<br>- No clear cycles<br>- No brute force | Creativity | **Creative work process** |
| - Short description<br>- Middle description<br>- Long description | Process | |
| - Copyright<br>- Environmental issues<br>- Avoiding bias & discrimination<br>- Own data and materials | Ethical considerations | |
| - Reflection of the self<br>- Entanglement with technology<br>- Human-machine collaboration<br>- Interaction with technology<br>- Relationship with technology<br>- AI as assistant | Co-creativity | |
| - AI<br>- Complex algorithms<br>- NFTs<br>- Robotics<br>- Animation<br>- Virtual installations<br>- 3D<br>- GANs<br>- Photoshop<br>- Digital programs<br>- Text models | Digital technologies | **The toolbox** |
| - Photography<br>- Music<br>- Physical installations | | |

| | | |
|---|---|---|
| - Drawing<br>- Drawing Tablet<br>- Sculptures<br>- Painting<br>- Performance | Physical tools | |
| - Adventurous<br>- Aesthetics<br>- Curiosity<br>- Enhancing artistic & creative practices<br>- More efficient<br>- New art stream<br>- Playground | Positive perspectives | **AI Art** |
| - Novelty<br>- Emotional response<br>- Intensions<br>- Making a statement<br>- Originality | Important features | |
| - Critique social systems.<br>- Privacy & agency<br>- Spirituality & religion<br>- Social media<br>- History<br>- Culture<br>- Race & gender.<br>- LHBTQ+<br>- Inclusive technology<br>- Reflecting on the future | Societal | **Motivations** |
| - Theory<br>- Applications<br>- Interest in certain science<br>- Movement & Shapes | Scientific | |
| - Better understanding<br>- Challenges & possibilities<br>- Computational creativity<br>- Ethics<br>- Experimenting<br>- Exploring<br>- Explaining | Technological | |
| - Natural history<br>- Nature<br>- Climate change | Natural life | |
| - Extending humans<br>- Our perceptions<br>- The human condition | Human life | |
| - Educating<br>- Speaking<br>- Stimulate critical thinking.<br>- Tutorials & workshops | Knowledge sharing | |

# Appendix E: Code tree