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Imagining the Future of Creative AI Tools

A Co-speculative Workshop

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Creative artificial intelligence (AI) is often explored in terms of machine intelligence on a philosophical basis. As a counter-reaction, there have been calls for user-centered creative AI. This thesis aims to make visible creative practitioners' needs, values, and ethical perspectives that might inform us on the construction of future creative AI tools. It also discusses the need for pragmatic aesthetics as a holistic design approach. Five artists of different backgrounds were invited to a co-speculative workshop where they expressed their thoughts and imaginings regarding creativity, creative tools, and AI. The results suggest that we need to be mindful of virtue ethics, N-creativity, exploration, intuition, trust, and agency when designing creative AI tools. Furthermore, the findings were used to propose design sensitivities aimed at AI researchers and designers. Future research is needed in order to make conclusions about the practical value of the proposed design sensitivities.

SAMMANFATTNING

Kreativ artificiell intelligens (AI) undersöks ofta i termer av maskinintelligens med filosofiska grunder. Som en motreaktion har det förordnats mer användarcentrerad kreativ AI. Denna avhandling syftar till att synliggöra kreativa utövares behov, värderingar och etiska perspektiv som kan informera oss om hur framtida kreativa AI-verktyg bör konstrueras. Den diskuterar även behovet av pragmatisk estetik som en holistisk designstrategi. Fem konstnärer av olika bakgrund deltog i en samspekulativ workshop där de uttryckte sina tankar och föreställningar om kreativitet, kreativa verktyg och AI. Resultaten pekar på att dessa verktyg bör designas med begrepp som dygdetik, N-kreativitet, utforskande, intuition, tillit och datainverkan i åtanke. Vidare användes resultaten för att föreslå designkänsligheter riktade till AI-forskare och designers. Vidare forskning krävs för att kunna dra slutsatser kring designkänsligheternas praktiska nytta.

CCS Concepts: • **Human-centered computing** → **Interactive systems and tools**.

Additional Key Words and Phrases: n-creativity, creativity, creative ai tools, creative tools, creativity support tools, speculative design, co-speculation, co-speculative workshop

Nyckelord: n-kreativitet, kreativitet, kreativa ai verktyg, kreativa verktyg, kreativitetsstödjande verktyg, spekulativ design, samspekulation, samspekulativ workshop

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1 INTRODUCTION

From cave paintings to new media art – how we humans express ourselves is constantly evolving, and so are our creative tools. Artificial intelligence (AI), has paved the way for a new way of expression, and a concept called creative AI. As a reasonably new phenomenon, the definition of creative AI is not yet solid. Within AI research, creativity is often discussed in relation to machine intelligence. For instance, there are studies investigating machines’ abilities to create artworks, claiming that AI systems could be regarded as intelligent creative agents in their own right [12][15]. Other studies look to creative AI as a tool for creative co-creation [24][30]. In this report, creative AI refers to any technology used in creative practices that utilize AI somehow. It could be a co-creation tool, such as the robot arm Sougwen Chung uses in her painting practice [1]. It could also be an editing software like Adobe Premiere Pro where AI recently has been introduced to fasten workflows by intelligently re-time music clips to match video content [37].

Regardless of how one chooses to define creative AI, there have been calls for more user-centered AI design [5][43] – arguments that we need to consider how the human users will understand and make use of AI tools. Creative AI is a Human-Computer interaction issue, and not solely an AI issue [5]. This thesis frames creative AI as a tool made for human artists. One of the main purposes of the work is to investigate what kind of creative AI artists would like to see and engage with in the future. It does so by distinguishing creative tools as being either G-creative or N-creative; more outcome or process-centered [43].

The overall aim of the research is to answer the question “What are creative practitioners’ needs, values, and ethical perspectives that can inform the construction of future creative AI tools?”. Five artists with different backgrounds were invited to a co-speculative workshop. The qualitative oral, written and sketched workshop data were thematically analyzed. The findings were then used to propose several design sensitivities that could be considered when designing creative AI tools. The design sensitivities are limited to the qualitative data findings from the particular subjects of this study. They should not be seen as strict guidelines, but rather, as recommendations and thought provokers that could open up for further research and interesting designs.

The value in this work lies in the value of creative practice and art itself. History is documented through art. Art forms the richness and aesthetic experiences of human life. Art can be a way of self-expression, a therapeutic process that leads to well-being [39]. Artists work within creative industries – their labor and creativity result in movies, computer games, and music that many of us consume on a daily basis. In other words; art contributes to society as a whole, but also has an impact on single individuals. Artists and their art-making practice are thus worthy of careful study, especially when we stand in front of new technologies that possibly could reshape what art and art making is and entails. If art and creative practice should remain diverse and somewhat accessible in the future, with the human soul at its core, it is important that we look at the many ways artists might find use of AI, and that we do not limit creative AI to certain fields and target groups. This study – by looking at creativity and creative tools from a very open human-supportive perspective – is therefore also relevant from a social sustainability perspective.

2 BACKGROUND

In order to contextualize this project, I will introduce different definitions of creativity, including the definition of N-creativity. I will also present related research on creativity support tools – a subfield to HCI where AI has been recognized as a potential amplifier. Finally, I will give an overview of creative AI and describe virtue ethics – an ethical theory that can be utilized when designing creative AI technology through a critical lens.

2.1 Defining creativity

Just as any virtue, creativity is a fluid term, complicated to define. According to the most commonly referenced definitions of creativity, creative ideas are original and appropriate for the task at hand [8][26][42]. Other common views state that creativity should result in valuable novelty [43].

As creativity generally is seen as a human intelligence-dependent virtue, many researchers are interested in whether or not AI can push machines to become creative agents. Still and D’Inverno [43] have made an interesting contribution to the discourse on creative AI by trying to untangle the term “creativity” and by making suggestions to AI researchers. Still and D’Inverno claim that creativity has become a blanket term when in reality, there are two distinct theories of creative activity that derived from two distinct meanings of “creative”. N-creative is a way of immersive living and acting in the world, inherent in all aspects of life unless constrained. G-creative, on the other hand, is based on the power to generate valuable novelty, aimed at art and inventions that exist separately from their creator. Since the focus is on products that belong to the world of profit and economic growth, the term does not readily include improvised dance, music, and story-telling [43]. The N-creative approach is more universal, and Still and D’Inverno [43] suggest that AI researchers adopt “an “N-creative approach to designing systems that support being in the world, enhancing and supporting human creative activity in all its forms”. Furthermore, they also encourage questioning why we would ever want artificial G-creative systems to begin with [43].

2.2 (Intelligent) creativity support tools

Creative support tools (CST) aim to support users within different creative industries and fields in their creative process. As a subfield of HCI, these tools have been well-documented within HCI research for over a decade [16][17]. Based on the literature review of 143 papers, Frich et al. [16] define CST as follows: “A Creativity Support Tool runs on one or more digital systems, encompasses one or more creativity-focused features, and is employed to positively influence users of varying expertise in one or more distinct phases of the creative process” [16]. A majority of these tools are targeted towards designers, but researchers have also shown interest in creating tools aimed at musicians, choreographers, composers, painters, filmmakers, illustrators, and writers [16]. For instance, the CST “Drawing Apprentice” facilitates collaborative digital sketching with the intention of improving artistic skills [13], and the CST “Choreographer’s Notebook” serves as a video annotation system for dancers and choreographers [41].

Gabriel et al. [17] highlight the need for Creative Support Systems (which includes CST) to cover multiple phases of the design process across different collaborative settings. To do so in the most adapted way, the cognitive pattern and behavior of users have to be considered, which implies the introduction of AI [17]. Main and Grierson [32] note that intelligent CST likely would change the dynamic between tool and user. Researchers and designers of these tools would have to decide what kind of role the tool should play in the design process. Perhaps, it could take the role of a monitoring nanny, a facilitating pen-pal, a knowledgeable coach, or an intelligent colleague [31]. We have already seen human traits assigned to technology in the form of commercial voice assistants such as Siri and Alexa. Perhaps, future creative tools might not only be “intelligent” but also be assigned with faces, voices, and personalities in a similar fashion.

2.3 Creative AI – tool or threat?

AI is a set of algorithms designed to function parallel to human intelligence actions such as decision-making or creativity [33]. For decades, artists and researchers have been interested in writing computer programs that can generate art, but it is not until recently that AI has infiltrated the art scene. The source behind this new way of art-making is called neural

networks. One of the most popular neural networks, called Generative adversarial networks (GAN), was introduced by Goodfellow in 2014 [21]. By using neural networks, artists can set up algorithms that enable computers to “learn” an aesthetic by looking at many images using machine learning [33]. Neural networks have been used by artists and researchers alike. For instance, Ge et al. [19] proposed and evaluated outputs by “DoodlerGAN” – a part-based GAN that generates sketches of birds and creatures, and the artist Scott Eaton has used his own neural network to paint his hand-drawn sketches of human figures¹.

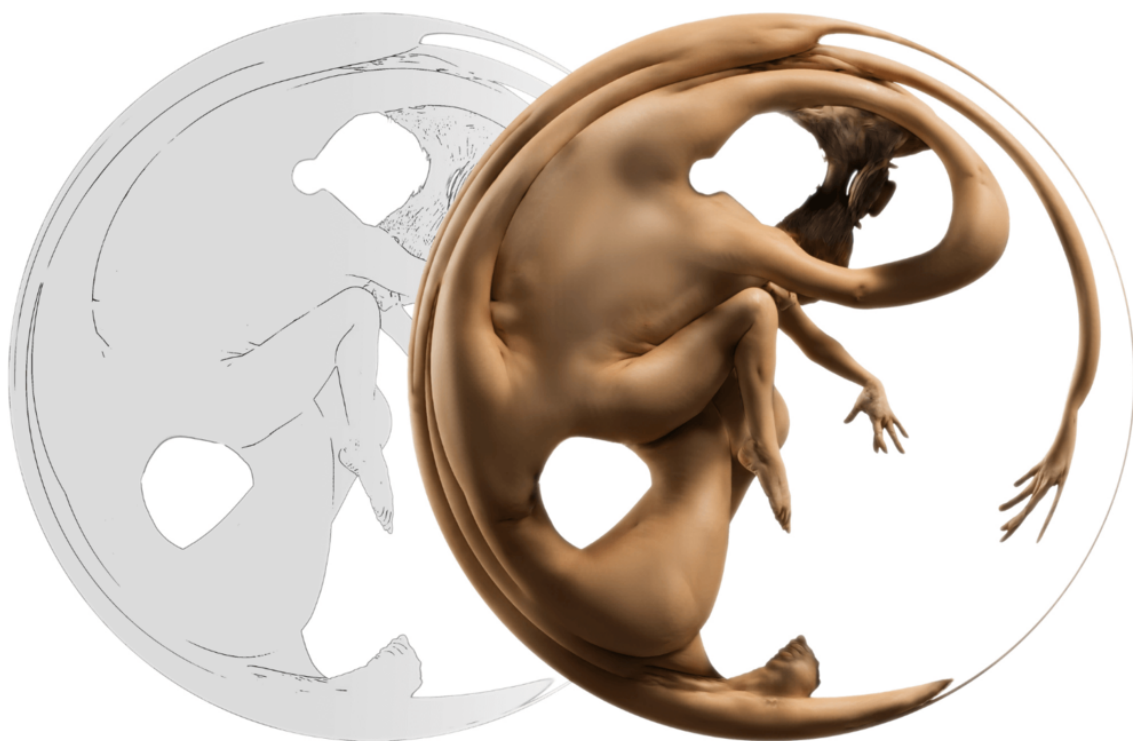


Fig. 1. AI artwork by figurative artist Scott Eaton, hand drawn and painted with Eaton's Bodies neural network. (<https://aiartists.org/scott-eaton>).

Creative AI is a controversial topic. Many claim that there is no such thing as machine creativity – that art requires human intent, inspiration, and a desire to express something. Yet, scientists have been eager to explore the topic and many practitioners even present their AI algorithms as artists or potential artists [22].

The Turing test [44] is often used as a means of deciding whether a machine is intelligent (or creative, in the context of creative AI) or not. In the original test, an interrogator asks questions via a teletype to two players, one of which is human, the other a machine. If on average, the interrogator cannot tell which player is the machine and which is human, the machine might be regarded as intelligent [18]. The Turing test was used in a research project by Elgammal et al. [15], where a variant of GAN – a creative adversarial network (CAN) – was used to create AICAN, an almost autonomous machine artist. A visual Turing test was then used to register how people reacted to the generated images and whether they

¹<https://aiartists.org/scott-eaton>

could distinguish between AICAN- or human-created art. The result shows that the human subject could not tell whether the art was made by a human artist or by a machine [15]. Studies such as the AICAN study provokes concerns about AI as a threat or rival to art made by humans. The press and media also fuel this fear, writing about the potential of AI acting creatively in its own right [23][28][35]. But according to some, the art world has nothing to fear in AI. Technology should not be seen as a threat, but rather, as a tool.

Hertzmann [22] gives a historical perspective on the matter, describing how new technologies always have stirred fears of displacing artists, just to later be accepted and provide new creative and professional opportunities. For instance, when photography was introduced in the 19th century, many artists were dismissive and saw it as a threat to “real art”. Today, photography has become widely accepted as its own art form, but it is also used as a tool by many painters who use images as reference pictures to paint from. Furthermore, photography has made image-making more accessible. Today, almost anyone can experiment with photography. Hertzmann speculates that AI will have the same trajectory. In a general sense, he argues that new technologies benefit art and artists, “creating new tools and modes of expression, and new styles of expression” [22]. What if creative AI could make creativity more accessible? How could AI be designed to allow new ways of expression? These are interesting questions that could be explored with an N-creative mindset to creative AI.

2.4 Virtue ethics

AI, with its power and use of data, poses potential harmful impacts on individuals, certain groups, and society as a whole. These risks include bias, discrimination, injustice, privacy infringements, increase in surveillance, loss of autonomy and overdependency on technology [38]. To mitigate or avoid these risks, it is important to consider ethics when designing intelligent technologies.

There are three major theories in ethics: consequentialism, deontological ethics, and virtue ethics [6]. Consequentialism states that the right action in any given situation is the one that will produce the best overall outcome [40]. Deontological ethics, or law-based ethics, conceives of ethics in terms of rules – actions are ethical as long as they do not violate the law [20]. Finally, virtue ethics emphasizes the virtues or moral character, how one develops good qualities (e.g. honesty or courage), and the ability to apply them. As virtue ethics is concerned with character, it focuses on long-term patterns of action, rather than single acts [20]. The emphasis on the development of habits is supposed to help a person achieve their goals, and, by extension, help them flourish as an individual [10]. Decisions can be analyzed and framed by questions like: “who do I want to be?” and “what do I hope to accomplish?” [20].

Initially, all three major theories were considered to be applied in this study. In the end, virtue ethics was found to be the theory that fits the topics that came to light during the workshop the most. In a creative AI context, virtue ethics implies that we look to the long-time goals of the users, who they want to be as artists and what qualities they want to develop. Virtue ethics could ensure that artists do not become too dependent on technology, and furthermore, it can ensure that creative AI is designed to support human artists, rather than replacing them.

3 METHODS

In this section, I present the employed methods of this study: co-speculation and thematic analysis. Co-speculation made it possible to base my design recommendations on other artists’ experiences and imaginings. Thematic analysis was chosen as a method for analysis as a way to make sense of the qualitative data systematically.

3.1 Co-speculation

Co-speculation is a collaborative method within speculative design practices [14] that incorporates non-design experts to speculate together with designers [45]. Wakkary et al. [45] write that “co-speculation is the recruiting and participation of study participants who are well-positioned to actively and knowingly speculate with us in our inquiry in ways that we cannot alone.”

Kawachi [27] claims that speculative design generally lacks participatory aspects to it. As participatory design and speculative design share many commonalities (future orientation, a focus on technology, emphasis on objects to spark engagement), it makes sense to bring the two practices together. Participatory design entails the involvement of stakeholders in the design process. It builds on the political and moral standpoints that people who are affected by design should have more power in the process [27]. In their thesis, Kawachi [27] concluded that co-speculation performed well and successfully engaged everyday citizens to generate their own speculative narratives and artifacts related to “ikigai” – a psychological state of feeling worthy for a living.

Co-speculation supports Still and d’Inverno’s idea of human-centered N-creative tools and how they should be developed; co-speculation places end-users of design in focus. Furthermore, the playful and active nature of co-speculation might have enabled study participants to better reflect and share opinions that might not have been possible in a traditional one-to-one interview.

3.2 Thematic analysis

Thematic analysis is a method for analyzing and interpreting qualitative data. It often involves the generation of codes and themes [4][11]. Codes capture interesting features of the data. They are the smallest unit of analysis that together constitute themes – larger patterns of meaning. Themes offer a framework for the researcher to organize and report analytic observations. This is important since the aim of thematic analysis is not to simply summarize data, but to identify and interpret key features of qualitative data [11].

According to Braun and Clarke [9], a researcher must actively decide between a bottom-up or a top-down approach when performing a thematic analysis. In the bottom-up (inductive) approach, the codes and themes derive from the content of the data, whereas in the top-down (deductive) approach, the codes and themes derive from concepts and ideas the researcher brings to the data [9]. In this study, a bottom-up approach was chosen. It was crucial to start by looking at the artists’ ideas and experiences first-hand, as this study is user-centric in the way that design recommendations are based on the artist’s opinions, views, and experiences. At the same time, the theoretical concepts from the literature review must have influenced how I looked, grouped, and interpreted the data. Braun and Clarke [9] note that thematic analysis is never purely one or the other, but a combination of both approaches; it is impossible to be purely inductive, and we rarely can ignore the semantic content of data when we code for a theoretical construct [9]. Nevertheless, the participant or data-based meaning was prioritized.

The aim of the thematic analysis is to present the findings and interpretations effectively. Since the data from the workshop were diverse – both written, oral, and sketched – and derived from different workshop tasks, it made sense to apply thematic analysis as a way to understand how the data connects as a whole and in relation to the research question.

Table 1. Participant overview

Pseudonym	Kind of artist	Level
Daniel	Interactive sound artist	Professional
Sheila	Vocalist, composer, free improviser	Professional
Clara	Beat producer	Hobbyist
Eleanor	Illustrator, animator	Student
Max	Singer, pianist	Semi-professional

4 CO-SPECULATIVE WORKSHOP

4.1 Participants

Five artists from different creative fields, aged 23-39 of American, French, Australian, Chinese, Peruvian, and Swedish nationality, were recruited to partake in a co-speculative workshop (see Table 1 for more information on the artists). The artists are referred to by pseudonyms. Some of the participants practice their creativity professionally, others semi-professionally or as a hobby. To partake, no previous experience with AI was needed. However, one of the artists, Sheila, stated that she “kind of ” had used AI in her creative practice before, as she recently built a dataset for a project which was used for gesture recognition. Another artist, Daniel, had used AI-generated sound classifiers, experimented with GAN systems for images, and had also worked with online sound systems which likely used AI to filter voices. All of the five participants stated that they were interested or open to using AI in their creative practice, although Daniel stated “I’m not very interested in AI on its own, but I think it could be a useful addition to a project”.

4.2 Co-speculative workshop

To explore artists’ thoughts, opinions, and imaginings of creative processes and tools, I planned and designed a two-hour co-speculative workshop. The workshop was carried out in smaller groups of three and two as I wanted there to be enough time for everyone to express themselves. The workshop took place in a classroom-like room, seated around a table where everyone could see and interact with each other. One of the five participants partook remotely via a video conference application. The content consisted of an introduction, a self-reflective exercise, a group discussion, and a speculative design challenge (See Figure 2) followed by a design critique. The workshop was documented through video, photos, and the written and hand-drawn data that the participants generated during the workshop.

The workshop began with a short introduction to creative AI, speculative design, and the aim of the workshop. A few examples of speculative designs unrelated to creative tools were shown to make sure the participants understood the freedom and future orientation of speculative design. Next, I moved on to explain what creative AI is and showed video examples of contemporary artists using AI in their creative practices [1][2][3][34]. The examples included artists from creative fields different from the participants, so they would not be too influenced by watching the videos.

The introduction was followed by an individual exercise where the participants were asked to fill out a self-reflection form on paper. The questions ranged from short answered questions (e.g. “What do you do in terms of creativity?”) to more elaborate questions that the participants might not have considered before (e.g. “Why do you create/perform/practice what you are doing?”). The self-reflection gave me insight into the artists’ current use of tools and their separate views on creativity. For instance, I learned that all participants strive to be playful and curious in their creative practice. I also learned that the participants use a mix of physical and digital tools and that for some, tools are “just tools” – suggesting



Fig. 2. Participants engaging in speculative sketching.

that they might not be the center of attention in the creative process. For others, tools are “sacred” and “an enhancement of creative practice”.

Next, we moved on to the group discussion. The group discussion was based on eight different statements/questions written on cards (see Table 2). The statements/questions concerned creative processes, creative outcomes, the notion of creativity, and the participants’ willingness to use AI in their own creative process. The stack of cards was placed in the middle of the table. The participants were asked to draw a card from the pile, read the question/statement out loud, and then respond to it – this made for a very relaxed and game-like feeling around the table. I sometimes asked a participant to elaborate on their thoughts or asked a follow-up question, but otherwise, the discussion was mostly handled by the participants themselves. The group discussion aimed to make the participants extend their thought on creative processes, tools, and AI even further, and furthermore, it prepared them for the design challenge that followed.

The workshop concluded with a speculative design challenge and design critique. The participants were asked to individually respond to the design challenge “If you could imagine any tool that could help you in your creative practice, what would it be?”. As guidance, the participants were provided with a paper template. On the template, the participants were asked to consider the name of the tool, the role of the tool, and at what stage of the creative process they would use the tool. They were also prompted to sketch and give a description of the tool (see Table 3 for more information on the speculative AI tools). When the sketches were ready, the participants were invited to present their ideas to the group. Each presentation was followed by a question and answer session. The participants were provided with sheets with examples of critique questions to ask each other, but they were also encouraged to come up with their own questions. Examples of questions include: “Would this tool be personal to you?”; “Could this tool be misused in any way?”; “Where does data come from and how is it collected?”

Table 2. Workshop questions

Questions
<ul style="list-style-type: none"> • What is most important to you: The process or the outcome? • What is most fulfilling in the creative process? • Getting familiar with my tools and learning how to use them is an exciting and important part of the creative process. True or false? • Are there tools that you consider as cheating? • Do artists have to create/express novel things/ideas in order to be creative? Follow-up questions: What is creativity to you? What makes a person creative? • More and more of our data, even our most personal and secretive information, are stored on digital databases. How would you feel about data on your creative process/outcomes being stored and analyzed? • Would you be willing to collaborate with an AI in your creative process? If yes, in what stage(s) of the process? What kind of role would the AI have? • Would using an AI tool affect your sense of ownership over your creative outcome?

Table 3. Overview of speculative designs made by participants of co-speculative workshop

Name of the tool	Description
Cherish This Time	an AI that picks out a personal photo/video/sound, plays it, and then deletes it.
Unnamed tool 1	an AI instrument made of glass, that can be used to create interesting visual/sound effects.
The Artist	a tool that asks the artist challenging questions while they create.
Unnamed tool 2	an AI software that quickly generates thumbnails/variants of the artist's sketches.
AI-piano	an intelligent piano that assists the singer with playing songs, recording audio, etc.

5 ANALYSIS

The workshop data was transcribed, collected, coded, and thematically analyzed on a Miro-board² (see Figure 3). Out of the material, four prominent themes emerged: (1) Creativity as a process and lived experience, (2) How to use creative tools, (3) Who sees my creative data and why is it collected?, and (4) Creative AI tools: many possibilities.

5.1 Creativity as a process and lived experience: “To be creative to me is to be authentic, and that requires that you live in the moment”

One of the most profound findings of the workshop is that artists create for the sake of creating, rather than the outcomes. Additionally, they also view creativity as something very personal and as a process that does not have to result in valuable novelty.

The participants seem to agree with Still and d’Inverno’s idea of creativity as immersive living and acting in the world. A good example of this is how the participants answered the questions in the self-reflection form regarding what the creative process entails and where they look for inspiration. For all participants, inspiration-seeking counts as part of the creative process, and inspiration can come from anywhere. Eleanor finds inspiration in conversations with friends and family, nature, small everyday moments, films, and tv-shows. She also feels inspired when listening to other artists speak about their practice. Clara wrote that inspiration comes from her own experiences and inner emotions. Sheila stated

²<https://miro.com>

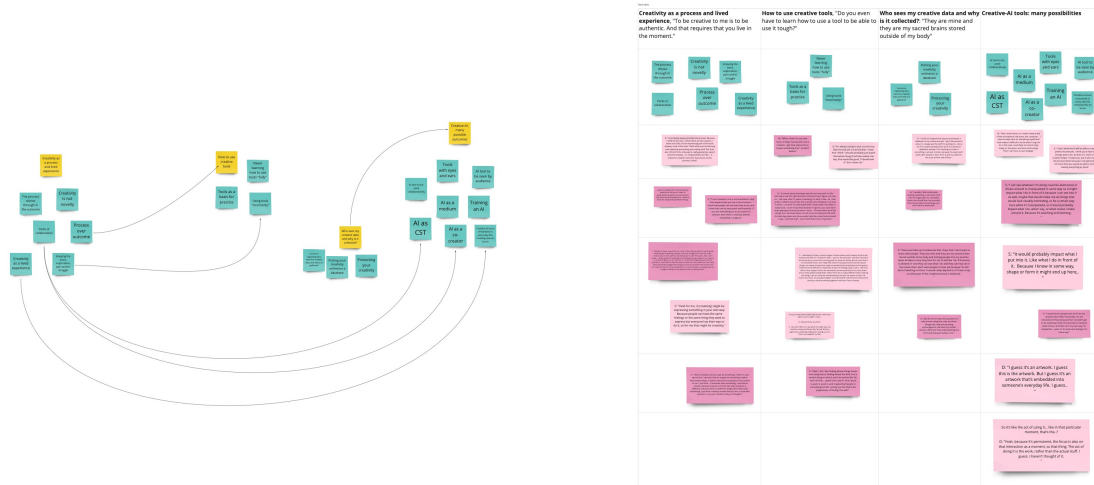


Fig. 3. Qualitative workshop data thematically analyzed on a Miro board.

that most of her ideas come when she is cleaning or doing dishes. The ideas are mainly grounded in her experiences, interactions in the world, poetry, and everyday phenomena. In other words, creativity is not bound to moments of making, it can happen anywhere – even in something as mundane and unrelated to art as cleaning and doing dishes.

When the participants had to choose what is more important to them – the outcome or the process – four out of five participants chose the process. Daniel explained “It’s the interesting part of the work anyway, most of the time. That’s where you are learning and exploring and testing and making stuff.” Additionally, Daniel wrote in the self-reflection form that he creates because he wants to understand the patterns and reactions that form the lived experience. Both Max and Eleanore wrote that they create because it makes them happy – in other words, creativity could be a way to engage with your emotions and the way you experience life. Based on these findings, it is fair to say that artists create for that lived experience that forms the creative process. When the artwork is out in the world, artists return to the process, creating something new. Even Max, who chose outcome over process (she loves to see how her work is perceived by an audience), said “If you don’t enjoy the process, you won’t be able to have a great outcome. You must love what you are doing and be engaged to get a great result.”

A final example of how the workshop findings support Still and d’Inverno’s work comes from Eleanor. For her, creativity could literally be anything, as long as it has a personal intent behind it. She began by explaining that even a person drawing a line on a paper could be creative, as that line is made by a person with their own set of unique experiences, thoughts, and intent. Later, she came to the conclusion that creativity to her is to be authentic, to live in the moment: “To be creative to me is to be authentic. And that requires that you live in the moment. I know that people can see their lives as art, and I think that can be very poetic and beautiful. If you see everything you do as a piece of artwork, then there’s creativity behind everything, I suppose.”

All of this lines up very well with Still and d’Inverno’s view on N-creativity and further proves why AI researchers and developers should be interested in N-creative tools rather than G-creative tools. The findings, furthermore, tell us that creative AI tools do not necessarily need to be bound to moments of making. A creative outcome does not have to be a performance, a piece of music, or a painting. If creativity is a way of immersive living and acting in the world, a

creative tool could simply be something that makes the user reflect or perceive the world differently – a shift in gaze or an internal state. In our digital age, it could be how the artist perceives and approaches their digital data. One of the speculative designs, “Cherish This Time” even alluded to this idea. “Cherish This Time” is a speculative AI that takes speech as an input and then shows a personal photo, video, or plays a soundtrack for the user, just to, in the following moment, delete the file. When using the tool, the user has to be immersed and prepared that anything from their data could be shown and deleted. It goes against how we normally think of and treat our digitized personal memories, which is why it could be seen as a kind of alternative performative artwork, according to Daniel.

5.2 How to use creative tools: “Do you even have to learn how to use a tool to be able to use it?”

How artists use and think of their current tools can also inform us on how creative AI tools should be constructed. Do artists prefer their tools to be “in the way” or more in the background of the creative process? How do the artists experience the learning process of figuring out a new tool? Is it important to use tools “properly”?

From the self-reflection form, I learned that all participants use a mix of digital and physical tools – their collective creative tools span from music production software and digital assets to musical instruments, notebooks, pens, and paper. Some of the participants see their tools as “just tools” – suggesting that they might not be the center of attention in the creative process. For other participants, tools are “important”, “sacred” or even “an enhancement of creative practice”. During the discussion, Max mentioned that she thinks it is important to learn how to use tools, and that tools determine what is possible and not. Tools can even make her more creative: “When I learn to use new tools, it helps me become more creative. I get new resources to create something that I couldn’t before.” The tools also determine the quality of what she produces as well as her general experience of the creative process. As an example, she told us about how her old microphone was “hideous” and that it made her feel bad when creating. When she bought a new one that recorded in better quality, she could think more easily and focus on the creative process rather than the tool.

Eleanor agreed on the importance of tools. At the same time, her experience of learning new tools differs depending on whether they are analog or digital: “Personally, I think it’s super important to learn how to use tools to be able to create what you want. But for me, if it’s an analog tool it’s a lot more fun to experiment and learn, than with digital tools. The software that they use in real animation studios... when you try to learn them there’s so much new and as I’m not used to them, it feels very difficult and I have a lot of mental resistance regarding that.” In other words, too advanced tools with many functionalities might not always be user-friendly and intuitive to use. Interestingly enough, the only digital tool that Eleanor enjoys using – Procreate (a painting application on the iPad) – resembles how it is to draw and paint on physical paper.

Neither Daniel, Sheila nor Clara seem to enjoy learning or mastering new tools. Both Daniel and Sheila mentioned that they often intend to master their tools in new ways, saving YouTube tutorials in their “watch-later” playlist, just to never get around to watching them. Possible reasons might be a lack of time or motivation. Daniel explained that to him, it never is about learning how to use tools fully, but about picking out the little threads of a tool that you need, and learning how to problem-solve: “It’s never about learning a specific tool very well, it’s like learning to ask the right questions.” The reason Sheila might not get around to watching tutorials might be because she enjoys to fight and struggle with her tools: “I like finding where things break and using that or finding where the limit is of a certain thing or what it can’t do and be like ‘ok, can’t do that.... great! Let’s use it!’. And I push it, push it, push it, and maybe that results in something horrific coming out but that’s the playfulness of finding ‘the wall’”. In other words, it seems like she enjoys the problem-solving aspect of figuring out new tools. Sheila also went on to mention that to her, there is no right way to use tools: “You can

use tools ‘incorrectly’ and still have something great come out of it” The others in the group, Daniel and Elanor, nodded in agreement.

Playfulness and exploration seem to be important for the artists. Clara said: “I wouldn’t say ‘learning’ [the tool] is exciting. I would say exploring the tool is more exciting.” Clara worries that AI will create certain limitations in her process. Today, she has the impression that AI is mostly used in recommendation systems. If AI becomes too good at recommending sounds or beats to her, she worries that she will lose the fun of exploring tools herself.

To summarize, tools are important to artists. Tools can influence how artists experience the creative process and determine what is possible. For some, analog tools are more intuitive to use than digital. Advanced software with lots of menus might be difficult to learn and use in an intuitive way – something that might explain why some artists never put down the effort to master their digital tools fully. Instead, they enjoy exploring and playing with their tools. Exploration is very important to the artists. The possibility to explore creative AI tools and use them in intuitive and unexpected ways is therefore recommended.

5.3 Who sees my creative data and why is it collected?: “They are my sacred brains stored outside of my body”

Creativity can be precious. It can take time and consideration before an artist decides to share their creative process and outcomes with others. While Max generally does not worry about her work being stored on digital databases as she publishes her work online already, she also went on to explain that she would not be comfortable with all of her work being made visible: “I wouldn’t feel comfortable sharing everything. I only share stuff that I’m happy with, so I probably have a lot of stuff that I’ve recorded that I’ve just done to try things out. I don’t want to share that.” Sheila expressed a similar concern, explaining how her notebooks and folios are her “sacred brains” stored outside of her body: “Inviting people into my practice space all takes a very long time for me to feel like ‘ok, this person is allowed in’ and they can see what I do and they can hear all of the noises that I don’t want people to hear yet because I’m still kind of working on them.” As a summative statement, Sheila said that she feels “conflicted” about the idea of sharing her creativity with an AI.

Artists might not be comfortable sharing everything from the creative process with an AI tool – perhaps, only certain parts of it. Artists might feel differently depending on what kind of data is collected, stored, and analyzed. Hard data might not be that sensitive to artists, whereas artists might be more hesitant to share their creative sounds or sketches. In other words, what kind of data an AI collects should be carefully considered, and developers need to be aware that artists might not be willing to share everything from their creative process with an intelligent tool. Their willingness might also depend on how certain they feel that their data is stored securely and that it never will be leaked or be made visible to others – that the data is seen by machine, and machine only. Another aspect that might influence artists’ willingness to use an intelligent tool, is how much control they possess over their creative data. Sheila noted that in order for her to be willing to have her creativity analyzed by an AI, she must have a way to “get her baby back”. For artists to be comfortable, they might want the possibility to retrieve their data. The degree of ownership and control artists possess over their creative data is something designers also should discuss.

On the other hand, Daniel and Eleanor do not feel precious about their creativity, nor are they opposed to the idea of sharing their creative data with an AI tool, partly because they cannot imagine how anyone could make use of their creative data. Daniel explained that for him, a greater concern regarding AI is the intent of the companies behind the technology – concerns that relate to, for instance, surveillance rather than creativity. He explained: “For me, it’s also the question of why are we using this, why are these things free, why are we being encouraged to use by certain sectors, what are they really wanting out of it? And that part bothers me.” How to build trust between artists, intelligent tools, and

companies behind intelligent tools is something that also should be assessed and further investigated by researchers. This might be a marketing-related question, but I also imagine that it must be possible to implement trust fostering elements into the design of creative AI tools. Prior studies have shown that design aesthetics matters when forming user trust in technology [25][29][46]. The case of trust between artists and creative technology is quite unique, however, and should be investigated further.

5.4 Creative AI tools: many possibilities

Some of the topics from the previous workshop tasks came to light again when the artists got to sketch their own intelligent tools. The fact that the majority of the participants (three out of five) imagined helper tools, CST, tells us that many artists might not want AI to be too prominent in the creative process. This makes sense considering what the artists wrote and talked about previously during the workshop; that they enjoy the process and the importance of playfulness and experimentation. Even struggling and fighting with your tools can be enjoyable. The CST that were invented during the workshop include; a tool that takes care of the more tedious tasks during the creative process, allowing the artist to focus on what they truly enjoy; a helper tool that functions as a teacher, asking challenging questions to the artist while they create and finally; a CST used to visualize ideas and variants of a sketch quickly. In all of these examples, AI plays a minor or initial role in the process and the creative decisions are mainly made by the human artist.

“Unnamed tool 1” points to other interesting possibilities. This speculative tool is able to use physical elements, like water, as input. “Intelligence” in this case, refers to momentary response, where the machine creates something with what it is given at the moment. This idea also highlights the possibility of collaboration between AI and artists. AI does not need to be limited to the background process, some artists might like to bring their intelligent tool onto stage for it to be seen by an audience.

“Unnamed tool 1” seems to allude to the wish for AI to bring something new to the creative process. The same could be said about “Cherish This Time” – the speculative tool that shows and deletes personal memories in the form of images, videos, and sound recordings. This tool informs us that creativity does not only occur in moments of making, and that AI could help artists better live in the moment, reflect, and come up with ideas – something that also could make for interesting and useful tools.

In conclusion, there are many different possibilities on how AI could be used in creative practices. Just like there are many different ways to apply paint with a paintbrush, there will probably be a diverse way to use and work with AI in the future. Nevertheless, artists want AI to support human creativity, and/or it should bring new and exciting elements to the creative processes that simple “unintelligent” tools cannot offer today.

6 CREATIVE AI TOOLS: DESIGN SENSITIVITIES

Based on the findings, I propose eleven design sensitivities (see Table 4) that could be useful when designing creative AI tools. These sensitivities concern (1) virtue ethics (the ethical theory that emphasizes virtues and the development of qualities), (2) efficiency that fosters creativity, (3) the explorative artist and (4) trust and agency. The sensitivities are supposed to work as thought provokers, preferably used at the beginning of the design process, as many of them are fundamental to how tools work and are used.

Table 4. Topics and design sensitivities

Topic	Design sensitivity
Virtue ethics	<ul style="list-style-type: none"> • Can we develop this tool from a virtue ethical standpoint? • What kind of qualities do we think the targeted artist wants to develop? • How can our tool help the artist develop these qualities?
Efficiency that fosters creativity	<ul style="list-style-type: none"> • Is the tool used for efficiency reasons, or does it nurture the creative process... Can it do both? • If the tool is used for efficiency reasons, is it in favor of the artist's own creativity?
The explorative artist	<ul style="list-style-type: none"> • Is it possible to explore the tool, and use it in ways that we do not intend? • Is the tool easy and intuitive to use and explore?
Trust and agency	<ul style="list-style-type: none"> • How do we/the tool collect and use data? • How can we implement trust fostering elements into the tool? • Is it possible for the artist to retrieve data if they want to? • How do we communicate data usage to users?

6.1 Virtue ethics

As creativity is a fluid term, it would be appropriate to evaluate the qualities targeted creative practitioners want to develop before setting out to design creative AI tools. In this project, I learned that the participants strive to be curious and playful in their creative practice. These qualities also showed to be present when discussing other topics, such as how they approach learning new tools. In other words, qualities associated with creativity are interlinked with how artists act as creatives and how they think of and use their tools.

Virtue ethics look at people's needs and goals. By applying it, we focus on how AI can support artists, and in the long term; how artists can flourish as creative individuals. Without virtue ethics, there might be a risk of focusing too much on the AI end of the tool, and we might end up with tools that are exciting to use once but that do not offer enough support for long-time use.

6.2 Efficiency that fosters creativity

We often think of technology as something that helps us complete tasks faster, lessens the steps we have to take in order to achieve our goals, or even as something that makes the work for us. But do artists want creative tools to work this way? One of the participants worries that AI might deprive her of the fun of exploring tools herself.

These design sensitivities are meant to interrupt our usual mindset of how technology works. What task do we think an artist would like to speed up? What task do we think artists enjoy and should be left unchanged? Some tasks within creative practices might be valid to streamline. For instance, one of the participants came up with a tool that would allow her to focus on singing while the tedious, technical tasks like recording are taken care of by an AI.

It is important to question if the efficiency in tools is made to be in favor of the artist's own creativity. Otherwise, artists might lose the fun of problem-solving and engaging in the process.

6.3 The explorative artist

"Exploration" was a commonly used term during the workshop. None of the participants enjoy reading manuals or watching tutorials about their tools unless they have to. As one of the participants explained; the exciting part about new tools is to explore them, not learning how to use them. Furthermore, artists seem to appreciate when tools are intuitive to use and when they offer an element of surprise.

These design sensitivities can make for fun, user-friendly and creative tools. They also prevent rigidity. Ideally, it should be possible to "misuse" tools – to use them in different, and perhaps, unexpected ways. This does not mean that tools have to be complicated or offer a vast array of functionalities (complicated software can repel new users), but they should not be too simple and predictable. An AI software that takes a user-selected image as an input, and then transforms it in some way as a finished output, is unlikely to be useful for artists in the long run.

6.4 Trust and agency

The last design sensitivities concern trust and agency. Data will be fundamental to AI – it is given that data will have to be discussed when designing creative AI tools. Data, however, is a sensitive topic, and there are several aspects about creative data that are worth considering as they might have an impact on how creative tools are perceived and viewed by artists.

In this project, I learned that artists can feel protective about their creativity. Thus, it is important that designers consider what kind of agency users possess over their own creative data, as well as how to mediate this to users. Communication is probably key, which is why it has been included as a design sensitivity specifically. If artists feel they are left under the light about how their creative data is used, collected, and analyzed, they might develop negative emotions towards their tools such as suspiciousness or regret. Tools might even become an antagonistic force in the creative process when in reality, tools should be there to support artists.

7 DISCUSSION

Many artists have already found a way to make use of AI in their creative practice. AI has also started to appear in common commercial tools such as Adobe Premiere Pro [37]. This is just the beginning. Just like AI will revolutionize many other parts of society, it will likely revolutionize creative fields – contributing to the development of new tools and art forms. Within computational creativity, researchers have long been interested in creativity and AI [22]. The focus, however, has leaned towards the machine-end of making – something that has been criticized [43]. Still and d'Inverno [43] urge AI researchers to look to human supportive N-creative tools as they are more inclusive and likely would be of more use to artists. A possible trajectory for N-creative tools could be to introduce AI in an already established HCI area – Creativity Support Tools. Participants of the "Imagining the Future of Creative AI tools" workshop envisioned tools that could be classified as CST – tools that are used more in the background or in the initial stages of creative processes. Participants also envisioned novel tools that possibly could reshape the notion of art and creative practice, or that could be used in scenarios where artist and machine create art in synergy. Future creative AI tools could take shape in many different forms. The important takeaway is that technology should be there to support human artists.

7.1 Pragmatist aesthetics

In this thesis, I set out to bring forward creative practitioners' perspectives that might inform us on the construction of creative AI tools. No matter what the participants envisioned or thought of creativity and tools, they all value the process of exploration and problem-solving that creativity entails – in most cases, even more so than their creative outcomes. The nature of creativity and art-making might call for other design approaches than the ones we are used to. Design sensitivities, such as the ones that I propose in this thesis, can provide concrete guidance, but a more holistic approach might also be needed. With this, I do not mean alternative methodology to human-computer interaction design. Rather, a different sensibility towards it, just like Wright et al. [47] suggest in their work about pragmatist aesthetics and experience-centered design.

A pragmatic design approach puts the emphasis on felt life and human experience. It provides a foundation from which to explore concepts such as playfulness, surprise, and enhancement [47]. Furthermore, pragmatist aesthetics promotes improvisation as the key modality in how the user explores the world and learns new aspects [36]. It offers a different way to relate to common concepts such as "know the user", "interactive design", and "user involvement" [47]. Since artists view creativity as a lived experience and often seek surprise and improvisation when using tools, it would be particularly fitting to use the pragmatic aesthetic approach when designing creative AI tools. This holistic approach in the context of creative AI design is something that could be explored in future research by asking questions such as "how could non-artist designers understand the felt life of artists when designing creative AI tools?".

7.2 Future research

This study has opened up many possible research areas. A similar study with a higher number of participants is recommended. With a higher number of study participants from more diverse creative fields, other patterns might be identified, and as a result, other design sensitivities might emerge. In that case, this study could be used as a point of reference for comparison. It would also be interesting, even necessary, to evaluate the proposed design sensitivities: how are they perceived by designers, developers, and researchers? Are they of any use? This study uses artists' opinions and experiences as a way to inform on what might be important to consider when designing creative AI tools, but it does not say anything about how it is to design with this knowledge in practice.

Another interesting direction would be to look more closely at artists' views on creative AI data. During the workshops, some participants seemed to struggle to form solid opinions on data and creative AI, perhaps because it feels like a foreign and unfamiliar concept. The use of creative AI prototypes (high-fi or low-fi) would likely make the concept more graspable. A qualitative study that makes use of prototypes would probably generate more valuable insights into the data-end of creative AI.

In this thesis, co-speculation made it possible to look at participants' subconscious wishes and perspectives in a visual way that complimented the spoken and written workshop data. To get an even more nuanced understanding of these speculative tools, the speculative design challenge could have been combined with design fiction – another sub-method within speculative design where the imagined technologies are placed within a context and/or a narrative [7]. This could also be performed in future research.

8 CONCLUSION

There have been calls for creative AI to become more user-centered. In this thesis, I have conducted a co-speculative workshop to engage with artists and learn about their needs, values, and ethical perspectives that might inform on the

construction of future creative AI tools. The workshop data were thematically analyzed, and findings were used to propose eleven design sensitivities. These design sensitivities suggest that we look to virtue ethics to ensure that we design N-creative AI tools, only create tools used for efficiency reasons if it is in favor of the artist's creativity, design tools that are explorative and intuitive to use, and finally, consider how to create trust towards users and what kind of agency users will have over their creative data. This thesis contributes to how HCI can understand and design user-centered creative AI tools.

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REFERENCES

- [1] 2016. This Artist Built a Robot to Draw with Her | Mashable Docs. <https://www.youtube.com/watch?v=jngkUu-aBz8>
- [2] 2018. Living Archive: A tool for choreography powered by AI. <https://www.youtube.com/watch?v=qshkvUOc35A>
- [3] 2019. Artist+AI Lecture: Figures and Form. <https://www.youtube.com/watch?v=TN7Ydx9ygPo>
- [4] Mohammed Ibrahim Alhojailan. 2012. Thematic analysis: A critical review of its process and evaluation. *West east journal of social sciences* 1, 1 (2012), 39–47.
- [5] Giuseppe Amato, Malte Behrmann, Frédéric Bimbot, Baptiste Caramiaux, Fabrizio Falchi, Ander Garcia, Joost Geurts, Jaume Gibert, Guillaume Gravier, Hadmut Holken, Hartmut Koenitz, Sylvain Lefebvre, Antoine Liutkus, Fabien Lotte, Andrew Perkins, Rafael Redondo, Enrico Turrin, Thierry Vieville, and Emmanuel Vincent. 2019. AI in the media and creative industries. (2019). arXiv:1905.04175 <http://arxiv.org/abs/1905.04175>
- [6] T.J.M. Bench-Capon. 2020. Ethical approaches and autonomous systems. 281 (2020), 103239. <https://doi.org/10.1016/j.artint.2020.103239>
- [7] Julian Bleecker. 2009. Design Fiction: A Short Essay on Design, Science, Fact and Fiction. (2009), 49.
- [8] 1996. *Artificial intelligence* (San Diego). Academic Press. 9780121619640
- [9] Virginia Braun and Victoria Clarke. 2012. Thematic analysis. In *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological.*, Harris Cooper, Paul M. Camic, Debra L. Long, A. T. Panter, David Rindskopf, and Kenneth J. Sher (Eds.). American Psychological Association, 57–71. 9781433810053 <https://doi.org/10.1037/13620-004>
- [10] Emmanuelle Burton, Judy Goldsmith, Sven Koenig, Benjamin Kuipers, Nicholas Mattei, and Toby Walsh. 2017. Ethical Considerations in Artificial Intelligence Courses. 38, 2 (2017), 22–34. <https://doi.org/10.1609/aimag.v38i2.2731>
- [11] Victoria Clarke and Virginia Braun. 2017. Thematic analysis. 12, 3 (2017), 297–298. <https://doi.org/10.1080/17439760.2016.1262613>
- [12] Simon Colton, Jakob Halskov, Dan Ventura, Ian Gouldstone, Michael Cook, and Blanca Perez Ferrer. 2015. The Painting Fool Sees! New Projects with the Automated Painter. (2015), 189–196.
- [13] Nicholas Davis, Chih-Pin Hsiao, Kunwar Yashraj Singh, Lisa Li, Sanat Moningi, and Brian Magerko. 2015. Drawing Apprentice: An Enactive Co-Creative Agent for Artistic Collaboration. In *Proceedings of the 2015 ACM SIGCHI Conference on Creativity and Cognition* (Glasgow United Kingdom). ACM, 185–186. 9781450335980 <https://doi.org/10.1145/2757226.2764555>
- [14] Audrey Desjardins, Cayla Key, Heidi R. Biggs, and Kelsey Aschenbeck. 2019. Bespoke Booklets: A Method for Situated Co-Speculation. In *Proceedings of the 2019 on Designing Interactive Systems Conference* (San Diego CA USA). ACM, 697–709. 9781450358507 <https://doi.org/10.1145/3322276.3322311>
- [15] Ahmed Elgammal, Bingchen Liu, Mohamed Elhoseiny, and Marian Mazzone. 2017. CAN: Creative Adversarial Networks, Generating "Art" by Learning About Styles and Deviating from Style Norms. (2017). arXiv:1706.07068 <http://arxiv.org/abs/1706.07068>
- [16] Jonas Frich, Lindsay MacDonald Vermeulen, Christian Remy, Michael Mose Biskjaer, and Peter Dalsgaard. 2019. Mapping the Landscape of Creativity Support Tools in HCI. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow Scotland UK). ACM, 1–18. 9781450359702 <https://doi.org/10.1145/3290605.3300619>
- [17] A. Gabriel, D. Monticolo, M. Camargo, and M. Bourgault. 2016. Creativity support systems: A systematic mapping study. 21 (2016), 109–122. <https://doi.org/10.1016/j.tsc.2016.05.009>
- [18] 2010. *Art practice in a digital culture* (Farnham, Surrey, England ; Burlington, VT). Ashgate Pub. 9780754676232 9781409408987 OCLC: ocn557403962.
- [19] Songwei Ge, Vedanuj Goswami, C. Lawrence Zitnick, and Devi Parikh. 2021. Creative Sketch Generation. (2021). arXiv:2011.10039 <http://arxiv.org/abs/2011.10039>

- [20] Judy Goldsmith and Emanuelle Burton. 2017. Why teaching ethics to AI practitioners is important. In *Thirty-First AAAI Conference on Artificial Intelligence*. 4836–4840.
- [21] Ian Goodfellow, Jean Pouget-Abadie, Mehdi Mirza, Bing Xu, David Warde-Farley, Sherjil Ozair, Aaron Courville, and Yoshua Bengio. 2014. Generative Adversarial Nets. 27 (2014).
- [22] Aaron Hertzmann. 2018. Can Computers Create Art? 7, 2 (2018), 18. <https://doi.org/10.3390/arts7020018>
- [23] Naveen Joshi. 2022. *Can AI Emulate Human Creativity?* <https://www.forbes.com/sites/naveenjoshi/2022/01/06/can-ai-emulate-human-creativity/>
- [24] Pegah Karimi, Jeba Rezwana, Safat Siddiqui, Mary Lou Maher, and Nasrin Dehbozorgi. 2020. Creative sketching partner: an analysis of human-AI co-creativity. In *Proceedings of the 25th International Conference on Intelligent User Interfaces* (Cagliari Italy). ACM, 221–230. 9781450371186 <https://doi.org/10.1145/3377325.3377522>
- [25] Kristiina Karvonen. 2000. The beauty of simplicity. In *Proceedings on the 2000 conference on Universal Usability - CUU '00* (Arlington, Virginia, United States). ACM Press, 85–90. 9781581133141 <https://doi.org/10.1145/355460.355478>
- [26] James C. Kaufman. 2016. *Creativity 101* (second edition ed.). Springer Publishing Company. 9780826129529
- [27] Masafumi Kawachi. 2020. Enabling citizens' speculation: The method of co-speculation for collectively imagining possible futures of 'ikigai' in an aging society. <http://urn.fi/URN:NBN:fi:aalto-202006143730>
- [28] Eleanor Lawrie. 2019. Could a computer ever create better art than a human? (2019). <https://www.bbc.com/news/business-47700701>
- [29] Yung-Ming Li and Yung-Shao Yeh. 2010. Increasing trust in mobile commerce through design aesthetics. 26, 4 (2010), 673–684. <https://doi.org/10.1016/j.chb.2010.01.004>
- [30] Duri Long, Mikhail Jacob, and Brian Magerko. 2019. Designing Co-Creative AI for Public Spaces. In *Proceedings of the 2019 on Creativity and Cognition* (San Diego CA USA). ACM, 271–284. 9781450359177 <https://doi.org/10.1145/3325480.3325504>
- [31] Todd Lubart. 2005. How can computers be partners in the creative process: Classification and commentary on the Special Issue. 63, 4 (2005), 365–369. <https://doi.org/10.1016/j.ijhcs.2005.04.002>
- [32] Angus Main and Mick Grierson. 2020. Guru, Partner, or Pencil Sharpener? Understanding Designers' Attitudes Towards Intelligent Creativity Support Tools. (2020). arXiv:2007.04848 <http://arxiv.org/abs/2007.04848>
- [33] Marian Mazzone and Ahmed Elgammal. 2019. Art, Creativity, and the Potential of Artificial Intelligence. 8, 1 (2019), 26. <https://doi.org/10.3390/arts8010026>
- [34] Oscillator Media. 2018. Automatic On The Road - Gonzo AI Robot Writes Road Trip Novel. <https://www.youtube.com/watch?v=TqsW0PMd8R0>
- [35] Arthur Miller. 2019. Can machines be more creative than humans? (2019). <https://www.theguardian.com/technology/2019/mar/04/can-machines-be-more-creative-than-humans>
- [36] Marianne Graves Petersen, Ole Sejer Iversen, Peter Gall Krogh, and Martin Ludvigsen. 2004. Aesthetic interaction: a pragmatist's aesthetics of interactive systems. In *Proceedings of the 2004 conference on Designing interactive systems processes, practices, methods, and techniques - DIS '04* (Cambridge, MA, USA). ACM Press, 269. 9781581137873 <https://doi.org/10.1145/1013115.1013153>
- [37] Eric Philpott. 2022. *New in Premiere Pro: Remix for music and 3x faster Speech to Text* | Adobe. <https://blog.adobe.com/en/publish/2022/02/08/new-in-premiere-pro-remix-music-3x-faster-speech-to-text>
- [38] Anaïs Ressayguier and Rowena Rodrigues. [n.d.]. AI ethics should not remain toothless! A call to bring back the teeth of ethics. 7, 2 ([n.d.]), 205395172094254. <https://doi.org/10.1177/2053951720942541>
- [39] Frances Reynolds and Kee Hean Lim. 2007. Contribution of visual art-making to the subjective well-being of women living with cancer: A qualitative study. 34, 1 (2007), 1–10. <https://doi.org/10.1016/j.aip.2006.09.005>
- [40] 1988. *Consequentialism and its critics* (Oxford ; New York). Oxford University Press. 9780198750888 9780198750734
- [41] Vikash Singh, Celine Latulipe, Erin Carroll, and Danielle Lottridge. 2011. The choreographer's notebook: a video annotation system for dancers and choreographers. In *Proceedings of the 8th ACM conference on Creativity and cognition - C&C '11* (Atlanta, Georgia, USA). ACM Press, 197. 9781450308205 <https://doi.org/10.1145/2069618.2069653>
- [42] 1999. *Handbook of creativity* (Cambridge, U.K. ; New York). Cambridge University Press. 9780521572859 9780521576048
- [43] Arthur Still and Mark d'Inverno. 2016. A history of creativity for future AI research. (2016).
- [44] Alan M Turing and J Haugeland. 1950. Computing machinery and intelligence. *The Turing Test: Verbal Behavior as the Hallmark of Intelligence* (1950), 29–56.
- [45] Ron Wakkary, Doenja Oogjes, Henry W. J. Lin, and Sabrina Hauser. 2018. Philosophers Living with the Tilting Bowl. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC Canada). ACM, 1–12. 9781450356206 <https://doi.org/10.1145/3173574.3173668>
- [46] Alona Weinstock, Tal Oron-Gilad, and Yisrael Parmet. 2012. The effect of system aesthetics on trust, cooperation, satisfaction and annoyance in an imperfect automated system. 41 (2012), 258–265. <https://doi.org/10.3233/WOR-2012-0166-258>
- [47] Peter Wright, Jayne Wallace, and John McCarthy. 2008. Aesthetics and experience-centered design. 15, 4 (2008), 1–21. <https://doi.org/10.1145/1460355.1460360>

