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Brittle Opacity: Ambiguities of the Creative AI

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This paper outlines the ambiguities which influence AI science, manifest in the production of AI artists, and shape the representation of creative AI in the media and in popular culture. Looking at the interrelated conceptual, discursive, ethical and other aspects of the prevailing approaches towards AI, it discusses some of the factors which obscure or mystify the important features of AI technologies vis-à-vis human cognition and artistic expression. Through a combination of tendencies and circumstances, these misconceptions and fallacies both emerge from and exacerbate the current issues of AI, which calls for vigilance and critical consideration by the creative actors and by the public. With regards to the existing literature, which primarily addresses the creative AI issues from techno-scientific and historical perspectives, this study focuses on the ideas, methodologies, cultural contexts, and social impacts of AI art practices. It shows that current capabilities and transformative potentials of AI require artists—as well as scientists and entrepreneurs—to engage in a sharper critique of their motivations and goals, in a deeper creative investigation of their tools, and in a more nuanced scrutiny of their work. This will catalyze research in science, arts and humanities to define more robust concepts of creativity, to map its perspectives, and to inform our directives for further development and responsible application of AI.

1. Introduction

The research in artificial intelligence (AI) has been historically inspired by broadly defined concepts of intelligence found in living beings, branching out into various and sometimes conflicted neural models which can be highly abstract in their relation to cognitive and electrochemical models of the brain (Zheng and Sicker 2013; Sloss and Gustafson 2019). It has been targeting high-level cognitive functionality which includes the expressions of human intelligence in artistic creativity (Boden 1998; McCorduck 2004). Contemporary AI research centers around a machine learning (ML) paradigm called a neural network, which consists of parameter-processing units ("neurons"), input/output, and control modules. Such system can be programmed to refine the procedure for solving a particular problem by dynamically modifying parameters based on the referential data. Deep Learning (DL) is a subset of ML methods in which the optimization of network performance and accuracy relies on complex statistical rules applied to multiple layers of neurons (Bishop 2017; Nielsen 2019). The expanding research and implementation of ML have evolved into a range of creative disciplines that engage in the development, application or study of AI, and I use the term creative AI to address the field of these disciplines.[1] The increasing accessibility of DL since 2009 has enabled artists to start exploring the AI systems. Their work contributes in different ways to the creative AI, and shares both the advantages and shortcomings of the field.

1. This concept of the creative AI is distinct to and critical of the anthropomorphic notions which assign the autonomous creativity to AI systems, mystify their agency and fetishize their authorship, for example in articles by Marks (2019) and Newton-Rex (2019).

The existing literature has approached the ambiguities of the creative AI from several viewpoints. Melanie Mitchell in *Artificial Intelligence* (2019a), as well as Gary Marcus and Ernest Davis in *Rebooting AI* (2019) provide a conceptual, technological, and social critique of AI focusing on computer science and engineering, media and popular culture. In The *Ethical Algorithm* (2019), Michael Kearns and Aaron Roth address ethical and social consequences of the conceptual and technical issues in AI algorithm design. In *The Artist in the Machine* (2019), Arthur I. Miller discusses AI art within a study of creativity he had taken in earlier work (1996, 2014). In *AI Art* (2020), Joanna Żylińska provides a multifaceted theoretical discussion of the current AI debate and its reflections in AI-driven visual art. In *Understanding and Creating Art with AI* (2021), Eva Cetinić and James She present a comprehensive overview of AI research that takes art as a subject matter, and outline the practical and theoretical aspects of AI art production. With the aim to expand these and other authors' critical consideration, I address the ambiguities of creative AI from the interrelated perspectives of new media art, mainstream contemporary art and cultural sector, focusing on the poetic and expressive aspects of experimental AI art. This perspective

is relevant to both artistic and scientific research in AI, and may contribute to its more appropriate handling by the cultural sector and to its more responsible representation in the media.

2. Concepts

Since its outset in the 1950s, AI science has been entangled with various epistemic uncertainties, conceptual challenges, and terminological issues. Most notably, the mutual non-exclusivity and the continuous range between the symbolic models of ML (based on logical rules) and the subsymbolic models (based on statistical methods) often prove difficult to control (Mitchell 2019a, 19-26, and passim). Looking for flexible hybrid solutions, recent AI research fluctuates the scope of these two models, but requires conceptual clarity to define the reliable methodologies for exploring such solutions.

This is compounded by the incoherent consideration of referential human cognitive abilities, for example in making the useful distinction between learned versus inherited elements of knowledge and skills. Human intelligence is not understood clearly enough in order to be captured with formally robust definitions and rules necessary for mathematical modelling and computer emulation. The ultimate emulation of human intelligence may even be unattainable with binary computer technology due to the undecidable problems in computability theory and the limits of mathematical formalization respectively established in Church-Turing Thesis and in Gödel's incompleteness theorems (Copeland 2020; Raatikainen 2021).

Intelligence is integral to human nature: a complex set of often conflicted cognitive faculties which have been evolving within the material, existential and social reality of our species (Pinker 2002, 217-304, 318, and passim). The idea that intelligence should be studied within the framework of human nature is controversial in the humanities, social sciences and other disciplines (Pinker 2002, 205-450; Buss 2015). It is also underappreciated in many domains of AI research, which affects both the cognitive scope of the systems modeled on human intelligence and their ethical applications. Mainstream AI protects its market incentives by being "politically correct," and by exploiting technologically feasible routes for the applicable narrow-focus platforms. However, without robust and flexible control algorithms analogous to human common sense, narrow AI systems struggle with accuracy and safety in handling statistically extreme (rare) but plausible scenarios (Mitchell 2019a, 84-95). As Marcus and Davis (2019, 20) summarize:

> Narrow AI alone is not enough. [Yet] we are ceding more and more authority to machines that are unreliable and, worse, lack any comprehension of human values. [...] For now, the vast majority of dollars invested in AI are going toward solutions that are brittle, cryptic, and too unreliable to be used in high-stakes problems.

Many notions about AI in the research community, as well as in popular culture, have been influenced by the narratives of science fiction literature and cinema. Science fiction may be inspirational, but it can also limit creative and critical thinking by canonizing certain ideas regardless of their validity, and by stimulating attractive aspirations that may ultimately prove to be meaningless or dangerous. In such context, one of the rational but potentially business-risky options for AI-related disciplines is the responsible acknowledgement of human nature informed by cognitive sciences. It could facilitate more rigorous research and more effective development by scrutinizing, deconstructing and reimagining the concepts, notions and claims about AI through a sharper, more sincere critical lens.

The conceptual issues of AI in popular culture, art and media, but also in science and in philosophical discourse, are additionally impeded by the unclear or arbitrary use of AI-related terms such as *Artificial Intelligence, Machine Intelligence, Machine Learning, Deep Learning*, and—most evidently—*Algorithm*. An algorithm can be formulated in different levels of semantic or mathematical abstraction with respect to its target system's executable code, so it has to be properly encoded in order to run successfully.[2] Therefore, the application of algorithms always involves a critical layer of translation which is often highly counterintuitive, cognitively costly and error-prone (Grba 2020, 76-77). Within a conceptual framework of computer science and technology, algorithm design involves defining a problem or task, finding its solution, creating and testing algorithms for this solution, translating the best algorithm candidate into software and (often custom-built) hardware systems, running, testing and debugging. Since the development of ALGOL programming language in 1958, this framework also includes the methodologies for designing high-level meta-algorithmic systems that learn how to write code from specifications expressed in natural language (Nye et al. 2019). Metaphorical use of the word algorithm which ignores these contextual basics, although colloquially economical, actually obscures both the intricacy and unpredictability of AI development and application.

2. Computer science informally views algorithms as tools for solving well defined computational problems. The statement of the problem specifies in general terms the desired input/output relationship, and the algorithm describes a specific computational procedure for achieving that input/output relationship (Cormen et al. 2001).

Another popular term whose uninformed use degrades the contextual milieu of the creative AI is *generative art* (GA). GA includes heterogeneous approaches (not necessarily involving AI) based upon consciously and intentionally interfacing the predefined systems with different factors of unpredictability in preparing, producing or presenting the artwork (Grba 2019, 4-5). Despite practical divergence and long history of GA (Boden and Edmonds 2019), the expression *generative art* has been often equated only with computational art practices or with AI art based on subsymbolic ML systems such as Generative Adversarial Networks (GAN) or Creative Adversarial Networks (CAN) (Chatel 2018).

AI art is an open-ended set of artistic practices based on the creative approach to different AI techniques and models, regardless of the degree of the artist's involvement with AI technology (McCormack et al. 2019, 39). Its conceptual scope derives from algorithmic art and GA, and is primarily (but not exclusively) informed by exploring and representing the phenomenology of subsymbolic ML systems. Contemporary AI art frequently thematizes human-centered notions of creative agency, authorship, and ownership of "creative property" in AI systems, for example in Huang Yi's choreographies with KUKA robots (Yi 2021) and Sougwen Chung's performances (Chung 2020).The AI artists which conceptualize the phenomena external to ML include Ben Bogart who analyzes the narrative and formal logic of popular cinema (*Watching and Dreaming* series, since 2014) (Bogart 2019), Benedikt Groß and Joey Lee who explore the semiotics of architectural shapes in satellite imagery (*The Aerial Bold*, 2016-), Ross Goodwin who uses language hacking to disrupt cinematic and literary stereotypes (*Sunspring* with Oscar Sharp, 2016 and *Automatic on the Road*, 2018), Libby Heaney who revisits the mediated pop-cultural and political conventions through deep fakes (*Euro(re)vision* and *Resurrection* (*TOTB*), both 2019), Nao Tokui (*Imaginary Landscape* and *Imaginary Soundwalk*, both 2018) and Shinseungback Kimyonghun (*Mind*, 2019) (Figure 1) who create conceptually strong and formally economical interactive installations based on various experiential topics.

Fig. 1. Shinseungback Kimyonghun, *Mind* (2019). Photo: National Taiwan Museum of Fine Arts.

3. Anthropomorphism

Anthropomorphism is perhaps the creative AI's most pronounced ambiguity. It is a tendency to fictionalize the existing narrow AI as the artificial general intelligence (AGI) charged with polar attributes (subjugation vs benevolence) rather than making better efforts to detect and correct in it a full spectrum of elusive human weaknesses, contradictions and biases that reflect in every technology (Winner 1980; Lee 2018).

In various modes, it influences the work in creative AI and its cultural representation (Mitchell 2019a, 227; Todorović and Grba 2019, 55-56). The epistemic uncertainties about human cognition, and prejudiced consideration of its contradictions, tend to obfuscate the real values, potentials, shortcomings and dangers of AI. Whenever an AI or any other artificial system outperforms some of our physical abilities, cognitive functions or manifestations of creativity by imitation, simulation or in some other way, we conclude that from now on humans will be (unsuccessfully) competing with technology in that domain (Pinker 2018). It is often difficult to evaluate, and easy to dismiss, the difference between the effectiveness of human intelligence and the efficiency of specialized artificial processes related to intelligence. As Nao Tokui remarked (2016-), AI should be not considered as the emulation of human intelligence but rather as an Alternative Intelligence with its specific range of functional logic.

Anthropomorphism also constrains AI research with regards to the alternative forms of creativity that automated systems could exhibit, which may include exploring their quirks and idiosyncrasies. This is partially a consequence of the pragmatic use of human features as references in mainstream AI, but maintaining human creativity as an exclusive paradigm signals either conceptual rigidity or intellectual inertia.

3.1. The Ever-Receding Artist

Popular interpretations of artistic creativity in relation to AI tend to exploit the ever "blurring line between artist and machine" (Elgammal 2018). They often unfold through naïvely polarizing comparisons of human and AI creations in order to consensually determine "who is the artist" and "what is real art" (Hong et al. 2019; Miller 2019, 289-295). Such comparisons are manipulative because they presume (and instruct the subjects) that their test material is art, so they usually content with determining weather and under which conditions humans can distinguish between human-made and machine-made art. They ignore two fundamental distinctions: *who* considers something as an artwork, and *why*.[3] Within the sociocultural and anthropological perspectives of making art, motivation, decision making, anticipative assessment and selection are crucial human-driven factors, regardless of the level of abstraction, complexity, technological entanglement or counter-intuitiveness of the tools used for effectuating these factors. Based on unfounded dualistic notions of creativity, and on the lack of appreciation that the arts are artificial by definition, these popular interpretations oversimplify the crucial artistic abilities such as cogency, economy, skill, style, analogizing, intuition, and anticipation. They also underappreciate the breadth of the constantly evolving impact of human physical, perceptual and cognitive features in making art.

The media and some art institutions try to sensationalize AI art by de-emphasizing human agency in the creative process,and by presenting the AI "algorithms" as artists (Schwab 2018; Browne 2020, 7-9). They disregard well-informed notions about the complexity of the relationship between authorship and technology (O'Hear 1995; Boden 2004; Boden 2010; McCormack et al. 2019, 42-43, 47; Grba 2020, 75-77). Computers, robots or algorithms are not artists because they do not embody human cognitive capabilities, skills and—most importantly—human motivations for making art (Hertzmann 2020). Namely, the poetic qualities of human-made artefacts are inherently instrumentalizable as virtue signaling means to impress, stand out, assert oneself, and move forward in sexual competition and social hierarchy. Among many other things, art is a

3. While sociologists have argued that art appreciation is not innate but learned (Dimaggio and Useem 1978), modern cognitive science has been providing evidence that art appreciation is not exclusively learned or innate but features both aspects (Miller 2001; Davies 2013; Høgh-Olesen 2019).

socially-constructed system for displaying mating fitness (intelligence, proteanism, creativity, sense of humor) and for exhibiting or gaining social status (Miller 2001; Høgh-Olesen 2019). So, by misidentifying AI systems as artists, the bio-dictated sociopolitical aspects of art are selectively masked in the popular domain because of the bio-dictated ambitions to gain an advantage in a broader sociopolitical context. Artists usually take a more interesting approach, as they consciously use AI systems to play with the variable abstraction of authorship vis-à-vis technology, to explore the notions of agency and learning in the creative process, or to accentuate the uncanny appearance of artificial entities.

3.2. The Uncanny Landscapes

Uncanniness is the occasional experience of perceiving a familiar object or event as unsettling, eerie, or taboo (Broad 2020, 36-37), and it can be triggered in close interaction with AI-driven imitations of human physical or behavioral patterns. Some AI artists approach it implicitly, for example by extracting human-like meaningfulness from machinic textual conversation in Jonas Eltes' *Lost in Computation* (2017) or by alluding the intimate familiarity of human body in Scott Eaton's *Entangled II* (2019) (Eaton 2020) which is comparable to earlier video works such as Gina Czarnecki's *Nascent* and *Spine* (both 2006), and Kurt Hentschläger's *CLUSTER* (2009-2012) and *HIVE* (2011). AI artworks based on deep fakes, such as Mario Klingemann's *Alternative Face* (2017) or *Libby Heaney's Resurrection* (TOTB) (2019), approach uncanniness explicitly by either disrupting or accentuating the formal persuasiveness of statistically rendered human visuals.

The artists' exploration of uncanniness is also related to hybrid artefactual or glitchy aesthetics that can be achieved by emphasizing the abstract visual representations of data in the inner neural layers of DL architectures. By relying on our pareidolic perception, these visuals play with "humanizing" the opacity of DL processes. This is a popular poetic line in AI art, with examples such as Memo Akten's *Learning to See* (2017), Mario Klingemann's *Neural Glitch / Mistaken Identity* (2018b), Weidi Zhang's *Lavin* (2018), Jukka Hautamäki's *New Parliament* (2019) (Figure 2), and many other.

Fig. 2. Jukka Hautamäki, *New Parliament* (2019). Detail. Image courtesy of the artist.

In *JFK Unsilenced* (*The Greatest Speech Never Made*), a project commissioned by the Times in 2018, Rothco agency took a reminiscent contemplative approach to uncanniness by exploiting the emotional impact of sound, and by referencing the romanticized image of the 35th president of the United States. Based upon the analysis of 831 speeches and interviews, John F. Kennedy's voice was simulated in a delivery of his address planned for the Dallas Trade Mart on 22 November 1963 (Rothco 2018). At the level of individual words and some short phrases, Kennedy's voice sounds familiar but overall tone is uneven, so the uncanny effect relies mainly on the context of the speech that young president never had a chance to give. However, even with perfect emulation of Kennedy's Boston accent, this machinic reincarnation could never come close to matching the eeriness of Kennedy's televised speech on 22 October 1962. It was contextualized by Cuban missile crisis in which sheer good luck prevented the multilateral confusion, incompetence, ignorance and ultimate insanity of principal human actors from pushing the world into nuclear disaster (Sherwin 2020).

4. Biases

Building the classification models for subsymbolic, big data-based ML systems require large training datasets of hand-annotated: texts, drawings, pictures, photographs, 3D models, music, videos, films, etc. (Khamis 2019). However, these systems often lack the objective reasoning criteria, which leads to the translation of sociopolitical biases, prejudices, and misconceptions from the human decisions used for model development into the machine-learned behavior (Kearns and Roth 2019, 32-48; Mitchell 2019a, 88-90).

These side-effects of AI design have been discovered by the AI scientists, but also by the artists. For example, Kate Crawford and Trevor Paglen's exhibition project *Training Humans* (2019-2020) (Crawford and Paglen 2019) exposed racial bias in the online image database ImageNet that has been widely used in ML since 2009. Consequently, ImageNet removed 600,000 images of people from its collection of more than 14 million images which have been downloaded from the Internet, and annotated by human workers of Amazon Mechanical Turk.

Biased AI design is sometimes intentional, for example in a disputed paper "Automated Inference on Criminality Using Face Images" whose authors Xiaolin Wu and Xi Zhang (full professors at a major university in China) claim that their supervised ML classifiers can predict with high accuracy weather a person is a convicted criminal based only on a driver's license-style face photo (Aguera y Arcas et al. 2017). Ironically — notwithstanding the issues of detecting, removing or preventing biases in AI systems — there is a deficit of individual biases and creative idiosyncrasies among the AI artists, which could spice up their projects into more provocative or inspiring experiences.

5. Ethics

Main principles for ethical AI comprise transparency/explainability, justice/fairness/equity, safety, responsibility, privacy, beneficence, freedom/autonomy, sustainability, and solidarity/social cohesion (Jobin et al. 2019). Disparate notions of these principles make it difficult to establish widely acceptable criteria and to implement them consistently as AI algorithms for evaluation, selection and decision making. That is because ethical principles are fuzzy categories which comply to generalized human interests in the form of Gaussian distribution whose long tails are problematic (Mitchell 2019a, 84-87), and throughout history they have been manipulated by ignorant or patronizing assumptions that human interests are compatible and homogenous.[4]

4. See Żylińska's critique (2020, 33) of Max Tegmark's discussion of AI ethics in his book *Life 3.0: Being Human in the Age of Artificial Intelligence (2017).*

For example, fairness is essentially defined by a set of rational or perceived interests, but these interests vary between individuals and groups, in different contexts and conditions. Individual self-interest—which can be pragmatically or unintentionally short-sighted, contradictory, self-deceptive, deceitful or inconsiderate—has a decisive impact on shaping our values, goals, and actions (Trivers 2011). Emotional immunity to most ethically relevant cognitive dissonances is an inherent feature of human mind. As John Hooker (2018) noted: *Ethical people can be worlds apart in their tastes, attitudes, ambitions, and achievements.*

In order to solve the problem of aligning values and goals between humans and AI systems we need to find the way to align values and interests between humans, which means that we will have to address our evolutionarily driven socio-sexual competitiveness. This requires reconsidering the roles of ambition, both on the individual and on the societal level, and its consequences as a major factor of human creativity. Critical understanding of ambition in economic enterprises will also be crucial for realigning the AI companies' values and corporate interests with the values and interests of end users.

6. Discourses

All branches of the creative AI face a temptation to exploit the ideological authority of digital paradigm and heightened socioeconomic attention to the field. It sometimes leads to overpromising or overstating in AI science and business (prompting hyperbolic media reports), to manipulative strategies in AI art, to dubious speculations about the AI's capabilities or consequences, and to extreme futuristic scenarios, either catastrophic or utopian (Marcus and Davis 2019, 30; McCormack et al. 2019, 11; Mitchell 2019b). In computer science, as Melanie Mitchel (2019a, 21) notes: [...] *many AI people joke that what approach to the AI they claim to take depends on where their funding currently comes from.*

Numerous studies which demonstrate and explain the conceptual specificity and functional limitations of AI systems fail to discourage popular beliefs that AI can, and ultimately will, acquire mental omnipotence and hyper-functionality that science fiction and singularity speculations ascribe to the AGI or to the artificial superintelligence. The examples include Ray Kurzweil (2005) in futurology, Nick Bostrom (2014) and Sam Harris (2019) in philosophy, and *Transcendence* (directed by Wally Pfister, 2014) in science fiction. The singularity speculations indicate their advocates' detachment from the inertias and materiality of every-

day life (however computerized or networked it may be), and imply regressive infantile delusions of immortality and omnipotence. Mirroring failed Silicon Valley's prophecies of computer-human synergy in the 1960s (Curtis 2011), they indicate not only how unfounded and ultimately irresponsible our current hyperbolizing of AI could be, but also warn about our myopic retrospection and selective historical outlook (Barbrook 2007).

If absorbed without critical scrutiny, broad speculations about AI may divert our attention from many important but already misrepresented issues of the field. For example, Joscha Bach, a Vice President of Research at the AI Foundation, opens his online introduction to a series of talks at the Chaos Communication Congress with:

> Artificial Intelligence provides a conceptual framework to understand mind and universe in new ways, clearing the obstacles that hindered the progress of philosophy and psychology. Let us see how AI can help us to understand how our minds create the experience of a universe. (Bach 2016)

This assumes and presents AI as an idealized, coherent, clearly defined and fully understood framework which provides a reliable conceptual toolkit for understanding such complex systems as human mind and the universe. AI is neither conceptually coherent, nor clearly defined, nor fully understood. Many authors cited in this paper identify these deficiencies, and AIArtists website lists them on a dedicated page (Anonymous 2021a). Additionally, current AI's epistemological dynamics is in direct opposition to the claim that AI can clear the obstacles that hinder the progress of philosophy and psychology because it is the obstacles in philosophy, psychology, and other related sciences that, among other issues, hinder the progress of AI.

Following a long-established trend in contemporary art, AI artists are tempted to augment the impact of their works through manipulative representational discourse that usually features critical considerations or sophisticated theoretical models but suffers insufficient competence or sincerity (Stallabrass 2006; Żmijewski 2011). They sometimes saturate project descriptions with elaborate (metaphorical or literal) questions which do not necessarily match the experiential outcomes of the works. For example, these are some of the questions that Libby Heaney ascribes to her work *Resurrection (TOTB)* (2019):

> The work asks what it means to resurrect icons of western music and questions notions of truth and labour. Is technology the new religion? What does it mean to use artificial means to bring someone back form the dead? Is death just simply another marketing consideration? [...] (Heaney 2019b)

When overdone, introductory efforts can diminish the experience of an artwork by patronizing the audience as pupils rather than independent thinkers capable of appreciating art through their own feelings, knowledge and intelligence. Several AI artworks expose the side-effects of inflated art discourse,, for example Disnovation.org's *Predictive Art Bot* (since 2017) (Figure 3). It is a chatbot which generates concepts for art projects based on current art discourse, and occasionally prophesizes absurd future trajectories for art on its own website and on Twitter (Disnovation.org 2017). It would be instructive to feed Predictive Art Bot's proposals to OpenAI's DALL·E network which generates images from text input comprising a range of concepts expressed in natural language (Ramesh et al. 2021).

Fig. 3. Disnovation.org (Nicolas Maigret and Maria Roszkowska), *Predictive Art Bot V3* (2017). Installation view. Photo: Gabriel Asper, CC NC-SA 4.0.

7. Authenticity

Mainstream AI suffers inadequate sensibility or open-mindedness for investigating the quirks of existing AI technologies and discovering their authentic creative potentials. Its emphasis on mimicking or reverse-engineering human cognition in lieu of discovering new technical models of intelligence is chiefly influenced by the lack of exact knowledge about human cognition and by the commercial interests which tend to collapse promising research ideas into conventional business practices. This may be corrected through a range of

directives for identifying the unexpected or surprising facets of emergent behavior, which can be explored further to expand the cognitive and poetic scope of AI, and to enhance the cooperation between human creators and automated systems. For example, the research of bioelectrical intercellular communication and decision-making during mitosis, which regulate cell behavior and gene expression for patterning and structural organization of tissues, offers new perspectives for computational modelling with possible applications in AI (Levin et al. 2021).[5]

5. The Levin Lab at Tufts University analyzes morphogenetic systems as primitive cognitive agents that manipulate information about their shape and make decisions about pattern regulation.

Some existing AI algorithms involve, exhibit and implement the key features of creative processes: aspects of undirectedness, generation of variance, intentional incurrence of costs for gaining knowledge, and the part-is-sacrificed-for-the-whole principle. However, these algorithms are not part of the marketed AI which is dominated by objective-driven, narrowly defined utility functions. Also, the goals of creativity-enabled AI may be in a trade-off with explainability and accuracy (Loi et al. 2020, 3-4). How effectively the AI systems will enhance human creativity, and how they should be designed to attain the conceptual coherence, agency and reliability that we can accept as (ethical) creativity are two related but possibly conflicted questions (López de Mántaras 2016; Roudavski and McCormack 2016; Gobet and Giovanni 2019; Loi et al. 2020). Notwithstanding these drawbacks and concerns, AI development stimulates human creativity by challenging knowledge, procedural literacy, innovation, inventiveness, wit and artistic expression.

Compared to other areas of new media art, the poetic range of contemporary AI art is relatively modest (Browne 2020). Most notably, it is deficient in projects that use AI systems as means to actualize well-defined conceptual platforms that meaningfully and effectively address broader perspectives of human existence. AI art involves computer technologies which, regardless of their complexity and rigidity, offer a generous space for conceptual, formal, methodological and aesthetic experimentation that can transcend the technologically imposed limits of expression. But artists have varying degrees of technical knowledge and skills for working with ML—ranging from bricoleurs through artist-engineers to engineer- and scientist-artists—and relatively few of them design their own systems. They often use the same code (DeepDream, CycleGAN, SNGAN, Pix2Pix, etc.) and train it with same data sets available on the Internet, which quickly results in homogeneity.

Therefore, they engage in a race to access the emerging code architectures before they become aesthetically "exhausted" (Bailey 2018), or to build new training models by curating original data sets. For example, Anna Ridler uses her own drawings and photographs as training material for Conditional Adversarial Network's Image-to-Image Translation (Pix2Pix) to stress the conceptual and formal logic of the reliance of interpretation upon memory and experience in both AI and in humans (Figure 4).

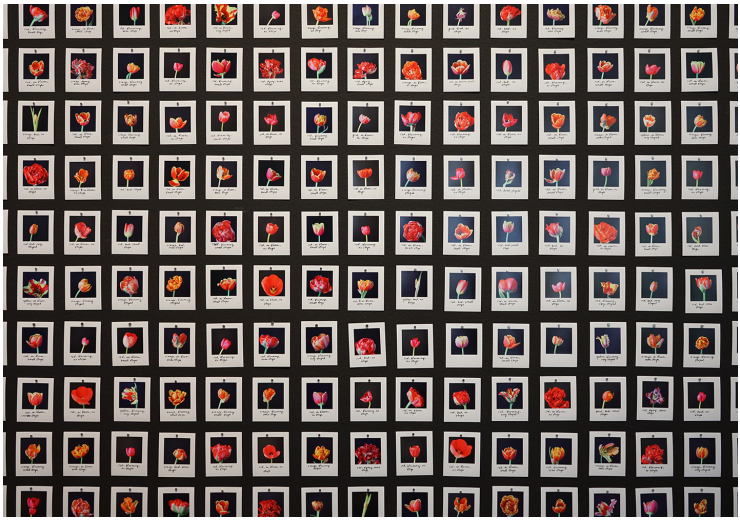

Fig. 4. Anna Ridler, *Myriad (Tulips)* (2018). Installation detail. Image courtesy of the artist.

Some AI artists push the pursuit of technical originality to the brink of obsession, in line with modernist myths of the heroic artist-conqueror (Miller 2019, 105, 127). Those who can afford it, seek originality in the spectacular by escalating formal richness and production/presentation values, for example Marco Brambilla (*Nude Descending a Staircase No. 3*, 2019) or Refik Anadol (*Melting Memories*, 2017; *Machine Hallucination*, 2019 and 2020; *Quantum Memories*, 2020). Such efforts are commendable, but may also indicate the lack of appreciation that originality can be misconceived or fetishized (Saltz 2019). Although it unavoidably reflects its technological reality, the poetics of AI art will remain constrained if the artists keep reducing their notions of authenticity and expressive cogency to prima facie relationship with technology. They may benefit by a more general recognition that, in principle, the improved functionality of AI systems emancipates human intelligence and creativity. In that sense, Man Ray's old critique of technically addicted artmaking applies:

> When my students present their wonderful [photographic] experiments [...] I have to tell them: this is your photograph, but it was not created by you. It was created by professor Carl Zeiss whom it took nine years to calculate the elements of the lens with which you can now capture even the slightest details of the face. (Bourgade 1972)

Additionally, high technical demands and fast competitive pace of producing AI art in current circumstances drain some of the artists' extra energy that comes from idleness and frivolity but often provides an invaluable touch of "dirt" which combines with experimentation, hard work, knowledge, idiosyncrasies, serendipity, luck and other decisive poetic factors.

8. The Art of AI

Its association with techniques and themes trending from AI science and technology exposes AI art to a critical consideration within the broader context of contemporary culture. AI art faces the intricacy, sophistication, and consequentiality of the creative work in computer science, robotics and other related fields. This techno-scientific work sometimes acquires artistic overtones notwithstanding the ambitions or the awareness of its practitioners. For example, tuning the hyperparameters[6] of the Convolutional Neural Networks (CNN) in supervised ML is highly experiential and intuitive, and AI scientists consider it as a kind of artistic process although it unfolds outside the art world (Mitchell 2019a, 82-83). Another example is a two-year experiment *Randomized Living* (2015-2017) in which former Google's employee Max Hawkins organized his life according to the dictate of recommendation algorithms (Hawkins 2021). He designed a series of apps that shaped his agenda by randomized suggestions based on the online data: a city where he would live for about a month and, once there, the places to go, people to meet, and things to do (Figure 5).

6. An umbrella term that refers to all the aspects of the CNN that need to be set up by humans to allow learning to even begin, such as the number of layers, the size of the units' "receptive fields" at each layer, the degree of change in each weight during learning, and many other (Mitchell 2019a, 82).

Fig. 5. Max Hawkins, *Randomized Living* (2015-2017): Random place in Tokyo, 14 July 2016. Image courtesy of the artist.

Randomized Living qualifies as a strong artwork of cybernetic-existentialism—the art of conceiving a responsive and evolving cybernetic system in order to express deep existential concerns (Dixon 2019). Instances like this suggest that artistic flavors of AI research could be arguably more interesting than current achievements of AI artists, but they also motivate the synergy of methodologies, skills and insights between various AI-related disciplines, which may be crucial for their advancement. As Vanessa Chang (2020) remarks:

> By extending humans' cognitive capacities, writing helped to sustain profound cultural transformations. AI may yet do the same. But as the uneven legacies of literacy suggest, the stories we tell with our writing tools are just as critical to cultural change as those tools themselves.

9. Entanglements

AI art requires technological infrastructures that are becoming ubiquitous and essential but remain largely elusive, exclusive, opaque and difficult to control. Artists build their projects upon multi-layered interconnections between programming languages, packages, libraries, APIs, software stacks and services that run on networked hardware with increasing complexity and pace of change. We generally consider these technical layers as guaranteed services of everyday life, but they are unstable and unreliable because they evolve according to capricious changes in business, technology and politics. Common technical functionality is predominantly aimed at satisfying the narrow windows of current procedural requirements, with reduced margins for backward or forward compatibility (Castells 2010).

The complex interrelatedness between artists' ideas, production techniques and presentational modes is inherent to artmaking, but the speed and volume of technological changes makes it difficult for AI artists to keep their projects running when the hardware/software systems they work with change significantly enough, usually in a time-span of several months. Furthermore, AI artworks are increasingly becoming time-based, continuous, interactive, relational, and dependent on various networked transactions during production or exhibiting (Grba 2021).

Similar to other media art practices, the technological entanglements and instabilities of the successful AI artworks are not mere byproducts or trade-offs, but are consciously integrated to serve as conceptual, tactical and existentially inherent expressive features of digital culture. Some artworks are created with exact intention to engage the sociopolitical consequences of ephemerality, and to address the fragility of information technologies by emphasizing their transitory character. The performative intricacies of technological entanglement are essential for experiencing the poetic identity of AI artworks, so it is difficult to preserve or recreate them without proper functionality of all their interdependent layers. However, their contingency and emergent character render the long-term preservation less relevant than timely and appropriate facilitation of these artworks within contemporary culture and education.

10. Dangerous Liaisons

Since the early computer art in the 1960s, experimental new media art has had an ambiguous relationship with MCA and, despite few intermittent hypes, remains both marginalized and occasionally exploited by it (Taylor 2014; Bishop 2012). Current surge of interest in AI- and crypto art has morphed from the MCA's association with post-digital art[7] throughout the 2010s. Post-digital artists thematize the affects of digital culture by using digital technologies as common utilities, and mainly produce their works in conventional materials and non-interactive media (Paul 2015). This approach conforms to the MCA's imperatives for tradeable materiality, but sacrifices the intricate tension between the artworks' conceptual, expressive or narrative layers and the contextual logic of the technologies in which they appear. With growing ideological authority and socioeconomic power of AI, MCA has been appropriating the AI phenomenology and, abiding by the post-digital formula, artists such as Hito Steyerl, Trevor Paglen, James Bridle, Gillian Wearing or Lucy McRae present their AI-derived works in marketable forms of installation, sculpture, video and photography.[8]

7. Sometimes also termed post-digital art, post-media art, and post-Internet art.

8. See for example Anonymous (2019).

The rising popularity of AI art in the past decade has allowed more artists to enjoy the patronage of large AI companies, and refreshed the supporting layers of digital culture such as virtual museums/galleries, online exhibitions, collections and marketplaces.[9] Notwithstanding their current momentum, it is uncertain how beneficial these platforms will be to experimental AI art because most of them were neither designed nor intended for such purposes. They have been increasingly incorporated into the MCA world whose selection criteria, operations and discourses are substantially market-driven (Stallabrass 2006; Shanken 2016, 465), so its interest in AI - and crypto art relates more to the commercial authorities of AI and blockchain than to problematizing and reimagining our relationship with digital technologies. For example, the AI and AI-related works that Ken Feingold (Figure 6), Louis Philippe-Demers, Patrick Tresset and other artists produced before the current AI spring remain largely overlooked by the MCA market although they explore the uncanny human-like behavior and question the meaning of technologically driven creativity.

9. Such as AIArtists.org, AI Art Gallery, Creative AI Lab, Nifty Gateway, OpenSea, Rarible, and others.

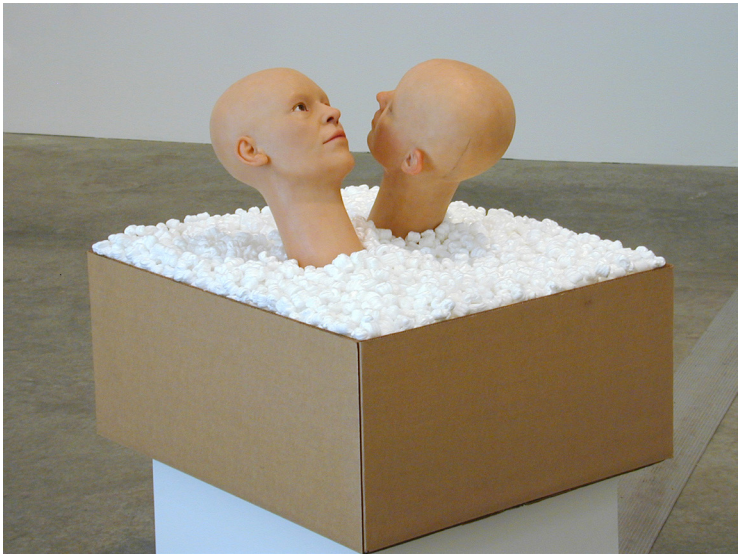

Fig. 6. Ken Feingold, *If, Then* (2001). Copyright 2001 Ken Feingold/Artists Rights Society, New York.

Seeking career advantages of institutional support, experimental AI artists are tempted to compromise some of the defining features of their artmaking in order to accommodate the MCA's requirements for scarcity, commercial viability, and ownership. Christie's sale of the French art collective Obvious' *Portrait of Edmond Belamy* in 2018 is a widely discussed example (Epstein et al. 2020). Competent AI artists are well-aware of the creative AI's subtleties and often

explore them directly in their projects, so they should be expected not to accede to the MCA's "streamlining" of AI art. However, soon after Christie's AI artwork sale, Sotheby's chose Mario Klingemann's *Memories of Passersby I* (2018a) for their debut with AI art. Although technically and formally superior to *Portrait of Edmond Belamy*, Klingeman's work also conforms to the MCA's demands by imposing custom designed material components which are conceptually, technically and aesthetically redundant. Its limited-edition set is protected by Bitcoin-based certification of authenticity, which could be considered as a more suitable, although in principle no less objectionable, option for enforcing scarcity and ownership of digital artworks. Within that context, blockchain crypto products such as the NFT have been readily adopted and made profitable by the MCA market (Finzer 2020; Anonymous 2021b). Christie's sale of *Everydays: The First 5,000 Days* by Beeple (Mike Winkelmann) closed on 11 March with a bid for 69.4 million USD (Hertzmann 2021).

It seems that, up to this point, the interactions between AI art and the MCA world have been reinforcing conservative modes of expression, trivialized concepts and impoverished aesthetics rather than inciting new creative initiatives (Browne 2020; Żylińska 2020). Artists' endeavors for entering MCA by complying to its market-driven orthodoxies may bear a high cost to creativity and critical edge which distinguish most experimental art. Hopefully, their future poetic strategies for addressing the MCA's demands have not been outlined by the logic of *The Next Rembrandt* (2016), a collaborative project by ING bank, Microsoft, Technical University in Delft and Mauritshuis art collection (Anonymous 2016). The MCA's commodification of the potentially avant-garde practices such as AI art may be understood from the aspect of commercial interests, but its conservativism diminishes the value of (artistic) knowledge in its capacity for change. It degrades our mentality and deprives our cultural heritage by enforcing arbitrary disproportion of visibility and relevance on different artworks. In a wider perspective, the MCA's capitalization of our primitive notions of possession and ownership based on our pragmatically constrained perception of existence and time (Heller and Salzman 2021) is unethical because it nourishes false intuitions about our special place in the universe.

11. Deep Else

Current conceptual, technical and representational issues of the creative AI have a wide-ranging impact on science, technology, economy, politics and social relations. On the other hand, through dynamism and versatility, the field has been able to tackle many cognitive challenges, conceptual issues and technical obstacles, and to make continuous if not fully coherent improvements.

Together with computer scientists, artists are responsible for the discovery, development and application of authentically creative and valuable AI systems. The actual and the potential transformative capacities of AI require them to engage in a sharper critique of their motivations, in a deeper investigation of their expressive means, and in a more nuanced scrutiny of their work. The artists' opportunity to establish relevant poetic frameworks within such context depends on their ability to cultivate well-informed ethical attitudes toward their expressive practices and professional goals in order to overcome the frustration of being simultaneously marginalized and exploited by MCA. Their contributive range spans between two horizons. One is shaped by providing veneer and cultural legitimization to the big game AI. Another one involves taking genuine risks for the cutting edge inventiveness by asking not just what the world of AI can do for me but also how can I, as a thinking human, meaningfully relate my creativity with AI to incite new ideas in the intelligent world.

The responsibility toward creative AI is clearly not exclusive to immediate actors such as scientists, entrepreneurs, artists and cultural operators. Beyond consuming hype or indulging in complacency, general public and institutions need to engage in a difficult and uncertain work of demystification and reconceptualization in order to match the conceptual and technical intricacies of AI which has been increasingly intertwined and instrumental in defining the quality of our lives (Żylińska 2020, 33-34). In a broader prospect for versatile and acceptable AI, we need to empower our research, business enterprises and cultural incentives with a courageous and sincere look at ourselves. A constructive insight into the creative AI's ambiguities requires a profound understanding of the intrinsic contradictions and inconsistencies of human mind, including those "protected" by our ignorance, arrogance, hypocrisy, vanity and delusions of self-importance. We need to face—and transcend—the cynicism which comes with realization that many unfavorable traits shape our mentalities, direct our behavior and influence how we make and use our tools. This will catalyze science-technology, arts and humanities to define more robust concepts of creativity, to map its perspectives, and to inform our decisions for the future AI.

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