

The Creativity of Artificial Intelligence in Art †

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† Presented at the Conference on Theoretical and Foundational Problems in Information Studies, IS4SI Summit 2021, Online, 12–19 September 2021.

Abstract: New technologies, especially in the field of artificial intelligence, are dynamic in transforming creative space. AI-enabled programs are rapidly contributing to areas such as architecture, music, the arts, science, and so on. The recent Christie's auction on the Portrait of Edmond has transformed the contemporary perception of AI art, giving rise to questions related to the creativity involved in this art. This research paper acknowledges the persistent problem, "Can AI art be considered as being creative?" In this light, this study draws on the various applications of AI, varied attitudes on AI art, and the processes of generating AI art to establish an argument that AI is capable of achieving artistic creativity.

Keywords: AI generated art; computational creativity; machine learning; artificial intelligence

1. Introduction

Artificial intelligence's popularity in artistic creation highlights this new art genre. However, the credibility of this art genre and aspects of creation are still enigmatic concepts that require intensive academic and practical investigation. In 2018, the AI Portrait of Edmond de Belamy triggered quite a controversy on whether it was created by a machine or replicated human creativity after it was sold for a price exceeding its initial prediction. Additionally, several ethical questions were raised related to the given. Since the standard elaboration of art assesses this notion as a form of communication between individuals, a new investigation that engages AI art requires supplementary strategies to the aspect of historical artistic work. Thus, we seek to begin to define a category of AI art. With this focus, this paper investigates if machines can partake in these creative processes, illustrate artistic abilities, and see if this abstracted set of processes is creative in itself. In addition, even if a creative process exists, are its results artistic, and if so, how is it associated with human-centered creativeness?

2. Articulation and Originality

Based on the portrait's question of articulation and originality, this research paper intends to assert its research questions based on the portrait's question of articulation and originality: To what extent can an artist claim AI art as he/his/she/hers(their) own? How does knowing an artist's identity (human or AI) affect the idea that AI can generate an original work of art? How does knowing an artist's identity (human or AI) affect one's evaluation of the artwork?

2.1. The Schema Theory

This theory offers a critical empirical framework for comprehending the audiences' attitudes on art based on the artist's identity. Hong and Curran state that a schema is "any active processing data structure that organizes memory and guides perception, performance, and thought" [1]. For instance, art Schemata would include comprehension of the art's concepts, audience perceptions that deem art more or less creative, the artworks we have been interested in or not, the aspects in which we view the works, and so on.



Citation: Cheng, M. The Creativity of Artificial Intelligence in Art. *Proceedings* **2022**, *81*, 110. <https://doi.org/10.3390/proceedings2022081110>

Academic Editor: William Seaman

Published: 6 April 2022

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Moreover, people possess schemata that include assumptions related to AI and a specific work's creativity. Since art is a medium that addresses various concepts, schema theory is viable related to studies of artwork. Studies have indicated that visuals are effective in activating schema, so the theory is credible in comprehending how AI-related stereotypes manipulate the audience's perception on AI's input. McCarthy highlights that there are individuals who would question if AI were able to perform like humans, even when AI's performance is objectively similar [2]. Alternatively, even if AI-generated works are similar to those generated by humans, people will still affirm that AI is incapable of creating the works, because of their innate conviction that art is that which emanates from humanly observations and efforts.

Therefore, this research paper evaluates different perceptions on painting created by either of the artists. When a painting is generated by two distinct constructs, how either of the works are assessed differs most depending on objective variation in composition and structure, as well as the audience's artistic bias. Other studies on art indicate negative stereotypes related to AI-generated paintings [3]. This paper uses the argument that individuals are due to offer a lower rating on paintings if they are generated by artificial intelligence. Thus, based on Schema theory, this paper proposes that painting produced by artists categorized with an AI identity, at this time, gain a lower rating on the value of their work, compared to paintings created by artists with a human identity.

2.2. Algorithms Used for Creating AI Art

GAN, proposed by Ian Goodfellow, is an approach of predicting generative models using adversarial pathways, which combinedly train two distinct models: first, the generative model (G) takes data distribution, while the second, discriminative model predicts the likelihood that a data sample emanated from a trained set instead of G [4]. While most of its outcomes are captivating, it is rather perceived as a novel illustration of the power that neural networks can utilize in art creation. Lots of applications implementing GANs have erupted, enabling an artist to repaint a picture based on a style that is consistent with one's favorite artist. In addition, the advanced new models are constructed by an artist to "understand" the aesthetics computationally by viewing different images via machine learning software. This algorithm later develops other images that adhere to the "learned" aesthetics. Although these machines are quite amazing at performing what they are instructed to do computationally, creativity is a different construct, and training them towards that direction is machine learning's nightmare—can AIs create artworks in a way closer to the human artist?

However, recent studies have introduced the concept of CANs [5], which are generated from GANs but with an extra component that enables its generator to function "creatively." This approach created art by viewing art and understanding/abstracting its style . . . then it becomes "creative" by augmenting the activation potential of the generated work by straying from that style. Besides, new systems that have been they proposed that since GANs are unable to produce creative work, yet an improvement on their objective output entity enables the production of quite "creative" designs by augmenting deviations from the listed styles and reducing deviations from design distribution. Recent studies have shown that human respondents could not differentiate between paintings produced by AIs from those created by humans. There is no significant distinction between their assessment of the two works, unless previously primed with the works' identities [6]. Although art generated by either GANs or CANs lacks the emotional intent found in humans, these artistic AI systems are already producing art in an extraordinary form. Hence, it is viable to regard creativity based on recent AI technologies. Even if these technologies are yet to match human creativity, it would be logical to imply that they have some capability to function in a creative manner. Thus, besides AI, artificial creativity remains a question in need of evaluation. As a result, this research paper proposes to assess "can machines be creative?".

3. The Creativity of AI

3.1. Human Creativity and Machine Creativity

The concept of creativity best expresses the potential of human ability. Sawyer, American's most known psychologist in creativity and innovation, addressed creativity as a "part of what makes us human" (p. 3). Thus, based on the comparison of machine to human intelligence, addressing the concept of creativity is paramount. As introduced earlier, creativity is among the chief merits that define the human mind/brain. Besides, mass parallelism, emotional capabilities, artistic, and aesthetic extents, creativity is one of the mind/brain's features. However, what of machines, which are not only non-human, but also non-biological? Would it be appropriate to speak of them in terms of artistic intelligence and creativity? In simpler terms, "can machines create art?". In his book on creativity, Sawyer explains that "although artificially intelligent computer programs hold the world title in chess and can crunch through mounds of data and identify patterns invisible to the human eye, they still cannot master everyday creative skills" [7]. Yet, they lack standard human-related creativeness, which needs physical exploit to be output. AI, through the explained artistic works, has a particular ability to create. Boden, a respected expert in the literature of informatics, cognition, and AI, argues against the idea that creativity is incomprehensible in computational intelligence [8].

Boden offers a different approach in this discussion. This chapter intends to address an alternative perspective to creativity based on AI. Additionally, besides human features that enable creativity, the chapter aims at considering the possibility of regarding AI creativity as an equal form of artistic creativity. To respond to these concepts, this study is grounded on artistic outputs of machine intelligence. Artistic creativity is the basis of this study as it regards aesthetic and emotional capacities that define human intelligence. As these forms are abstracted computationally in the following forms of artificial creativity, AI artworks will be found to contain features and values that indicate their creativeness.

Sawyer explains creativity by integrating three approaches: individual, cognitive, and cultural. Based on an individual approach, Sawyer proposed that "creativity is a new mental combination that is expressed in the world" [7]. Thus, he illustrated creativity using three primary entities: first, "creativity is new" [7]. He implied that being new or original is the most significant necessity of a creative idea or behavior. Repeating a previous behavior does not qualify it to be creative, so daily activities such as driving to work and back using the same way is a non-creative pattern of actions.

Based on Sawyer's suggestion, Boden provided that "creative ideas are unpredictable" [8]. consequently, the aspect of creativity should shine a degree of newness. On the other hand, Boden brings out a new perception on newness. She illustrates that children could imagine concepts, new to their minds. Therefore, the basis that someone else could have thought about that concept before, does not grant their concepts non-creative status. In this light, Boden highlights the aspects of historical creativity and psychological creativity. Using these distinguishable aspects, Boden highlights a new paradigm of creative ideas. The psychological creativity implies the evolution of unpredictable ideas which are new to the individual bringing it up, regardless of the idea having been conceived by other people. If an idea is entirely new and no individual has ever brought it up, then it becomes an example of a historical act of creativity.

Hence, based on Boden's suggestion, newness does not imply that something had not been thought before. This brings out Sawyer's second entity: "creativity is a combination" [7]. Every thought or idea is a composite of prevailing thoughts. According to Regan [9], remembering a previously understood concept does not indicate creativity on a particular action; instead, creativity is the combination of varied and existing concepts which were never brought together by someone else. Based on this interpretation, it is viable to suggest that since AI-generated paintings are a combination of different past paintings (for instance the Faceless Portraits), they are creative since they bring together different ideas to come up with a new idea in a surprising and unpredictable way.

This brings us to Sawyer's third entity: "creativity is expressed in the world" [7]. According to Kurt, for something to be perceived as being creative, it has to be expressed, because if an idea is conceived in someone's head but not expressed, it is neither seen nor understood [10]. This implies that a conceived idea needs to be expressed to receive feedback. At this point, this study brings out an important aspect of art-perception and attitudes that emanate from feedback. Suggesting that a new and combined concept needs to be expressed for it to be considered as creative. This is a one-sided definition of creative art, but based on Sawyer's individual approach, creativity could be explained using a cultural point of view. This viewpoint highlights that "creativity is the generation of a product that is judged to be novel and to be appropriate, useful, or valuable by a suitably knowledgeable social group" [7].

3.2. What Are the Values/Features of AI Creativity?

In regard to the inquiry of AI's capacity to be artistically creative, both Sawyer's and Boden's conceptualizations attempt to understand aspects of AI creativity, as well as the limitations that encompass those aspects. In order to demonstrate how the limitations can be refuted to explain AI's capacity to be creative, Boden highlighted three forms of creativity that can be addressed to indicate the value of AI art: combinatorial, transformational, and explanatory creativity.

3.2.1. Combinatorial Creativity

According to Boden, combinatorial creativity entails "making unfamiliar combinations of familiar ideas" [8]. By including different concepts, a new combination can be created unknowingly or knowingly. However, Kurt indicates that the combination should be value-added and new [10]. To some extent, this value is consistent with Sawyer's entity of an individual approach, which explains that creativity is new and a combination. Elgammal's Faceless Portraits illustrate combinatorial creativity. As stated earlier, when Elgammal was asked to present the renaissance artists who motivated his set, he released close to 3000 portraits. One of the paintings is the Portrait of a Youth Holding an Arrow, that dates from five centuries ago. The art, among others, brings out different features that were used in creating the Faceless Portraits. The 16th century painting is of Bolognese Girolamo Casio, with a positioned arrow. The painting describes indicates the art of weaponry and aristocracy which Elgammal uses in creating the various ideas exhibited in his series. The concept of weaponry is applied in the Faceless Portrait of a general, while aristocracy is utilized in the King's Portrait.

3.2.2. Explanatory Creativity

This form of creativity happens in a particular space and within the context of a particular style. Beginning with an existing style of thought, someone may take up this style and apply its basics to develop a new and inclusive outcome. Kurt explains that these styles can be formulated by idealistic spaces, cultures, or social categories, which are not born of a person's mind [10]. It could be a style of music, theory, or visual arts. Within that space or style of thinking, anyone who brings up a novel thought is perceived as creative using an explanatory perception. This form of creativity is substantial in bringing to light to this research's question because "it can enable someone to see the possibilities they had not glimpsed before" [7]. Explanatory creativity pertains to producing novel concepts and thoughts by exploring conceptual spaces and styles. The valuable ideas are mainly unexpected and new. Thus, the exploration of these ideas needs to be consistent with the standards of the adopted style of thinking. So, to satisfy the style's standards, someone needs to first understand them through learning. Machine learning applies the idea of artificial intelligence, which offers a space of algorithmic styles that are learned so that they can be implemented in new concepts. It contains numerous concepts from a variety of fields: philosophy, science, statistics, cognitive science, control theory, and many more. According to Kurt, machine learning is focused on the idea of developing computer

programs that evolve with experience [10]. When a machine implements a change in either of its programs or set of data, it learns and enhances its next performance. Consistent with the aspect of explanatory creativity, artificial learning engages changes with an existing and performing computer system.

3.2.3. Transformational Creativity

This form of creativity entails the transformation of an abstract space; hence, new ideas or concepts that could not be seen are generated. Imagination is fundamental in triggering transformational creativity. AI's perception process happens when a program identifies data in its neural system. When these neural networks are manipulated, machines create images rather than only recognizing them based on the instructions it is given. By utilizing the neural-assigned data, the programs generate images individually. Even if the concept, as imagined, seems incomprehensible to AI programs, Google's program, Deep-Dream, can generate dream-like images based on the name it is assigned.

4. Conclusions

Although AI art is often critiqued on the basis of creativity, this study established that AI art is artistically creative. This paper suggests that people who are committed to AI art are in the right place because by doing so, they have the opportunity to explore new AI technologies, discover the potential of a human's psychological process of creating art as re-embodied via computational abstraction processes, and actually make new forms of art. As Cetinic and the author state in their study of artistic application of AI, the extent to which we comprehend and interpret AI systems is still limited, and researchers in various disciplines are contributing to the development of the autonomy of AI. As technology advances, the boundary between considering AI as tools or as artists/creators is getting vaguer [11]. Thus, this study proposes that AIs have the potential to become "real artists". For artists who consider AIs as "artistic collaborators", this paper suggests they need to explore other possibilities to "control" their images within which AI programs base their created output, instead of focusing on mechanical augmentation of algorithms.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The author declares no conflict of interest.

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