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Video kills the radio star: Copyright and the human versus artificial creativity war

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Abstract

This article contributes to the dynamic debate surrounding the intersection of artificial intelligence (AI) and copyright law, offering a fresh perspective that builds upon interdisciplinary analyses. Focusing on the cognitive processes underpinning creativity in both human and AI contexts, the study draws a detailed parallel between Vincent Van Gogh's iconic "Starry Night" and its AI-generated counterpart generated through DeepDream technology. Central to the investigation is the application of psychological and neuroscientific theories to understand and compare the creative processes in humans and AI. Based on such exercise, the article first examines whether art generated with AI, devoid of human emotions and motivations yet capable of mimicking human creative cognitive processes, qualifies for copyright protection. The analysis suggests that the similarities between human and AI creativity, particularly in their cognitive structuring, could render the work "original" according to different jurisdictional standards and interpretation of copyright law. Second, the article investigates whether AI infringes copyright if protected material is used for its training and processing. This question becomes particularly relevant in light of recent legal actions against AI-artwork generators in California, which raise issues of potential infringement by AI using latent diffusion techniques on existing artworks.

The discussion provides an original perspective that can advance the ongoing debate on the use of copyrighted material for AI training. The paper aims to contribute to the ongoing debate about AI and copyright by challenging the traditional human-centric view of authorship in copyright law. The article argues for a nuanced understanding that acknowledges the complex nature of creativity, transcending the binary division between human and artificial sources. This approach is critical in redefining legal frameworks, ensuring they are adaptive to the evolving landscape of AI capabilities. At the same time, the article addresses the implications of AI drawing inspiration from existing art, recognizing the need to balance different stakeholders' interests when drawing policy considerations. Ultimately, the goal is to provide a layered perspective that not only deepens the legal discourse but also respects and fosters the coexistence and mutual advancement of both human and artificial creativity in the digital age, in line with the purpose of copyright.

KEYWORDS

AI-generated art, algorithmic creativity, copyright, human creativity, infringement

1 | INTRODUCTION

1.1 | AI and human creativity's "Starry night"—"A bridge over troubled water" of copyright

In January 2023, a group of artists has filed with the United States District Court of the Northern District of California a class action lawsuit targeted at Stability artificial intelligence (AI), Midjourney, and DeviantArt, companies that provide artificial intelligence powered image generators and transform simple text prompts into convincingly rendered images. The artists claim that such image generators violate copyright laws by using copyrighted images to train their AI and produce derivative works. The plaintiffs claim that these companies have infringed on 17 U.S. Code § 106, exclusive rights in copyrighted works, the Digital Millennium Copyright Act, and are in violation of the Unfair Competition law. All three companies mentioned have built their AI image generators on a software library called Stable Diffusion, which was developed by Stability AI. This model is built on a technological process called "diffusion" where the program is to reconstruct images that it has been fed and generate new images when it receives a prompt as an input.

The plaintiffs alleged that Stable Diffusion was "trained" using their copyrighted artworks without permission.[1] This training enabled the AI to produce new images that mirrored the styles of specific artists.[2] The complaint includes claims of direct copyright infringement, vicarious infringement, and violation of the Digital Millennium

Copyright Act (DMCA)[3] Central to this case is the question of whether AI-generated work can be considered derivative or transformative of the original works. In this paper, we will address the infringement issue, as well as the underlying themes of authorship and creativity.

Concerns related to intellectual property (IP) and AI are not new. Stakeholders and scholars have debated on patent and AI,[4] trade secrets and AI (reference anonymised), as well as copyright and AI.[5] The UK government launched two public consultations on AI and IP, including the subject matter of copyrightability of AI-generated works and text and data mining in relation to AI.[6]

In this paper, we contribute to the debate by providing an analysis on human and AI creativity. Specifically, we review literature from the fields of psychology and neuroscience to understand the mechanisms of human creativity, and then we compare the functioning of the creative human brain with the functioning of these creative algorithms. We use such comparison to build our arguments in relation to two challenges related to AI and copyright: whether AI-generated works can attract copyright protection, and if AI can infringe copyrighted material in its training and processing. We believe that copyright arguments can be informed by creativity theories for multiple reasons, but the most important from a legal standpoint is that copyright language both at statutory and judicial levels refer to creativity (author's own intellectual "creation" and modicum of "creativity" as originality standards, e.g.).[7] On this matter, this paper refers mainly to the European Union (EU) and the US jurisdictions, not with the aim of delivering a comparative analysis, but rather as part of the narrative examining issues surrounding copyright, AI, and creativity. In details, the United States—through the Andersen case—represent the perfect example to start exploring the challenges posed by AI to copyright fundamentals. Also, since current copyright infringement lawsuits reflect the prevalence of AI corporations being headquartered in the United States, the American legal system becomes inevitably significant for setting initial narrative of this paper. Conversely, the evolving regulatory approach to AI in EU may provide valuable perspectives on how it influences European copyright norms.[8] Furthermore, the inclusion of psycho-cognitive theories seems aligned with the strong EU human-centric approach to both copyright and AI.[9] Indeed, while such alignments features EU's attention on an ethical AI development, the paper discusses originality and infringement mirroring the same human-approach in the psycho-cognitive dimension of human creativity. Therefore, the aim of the article is to provide a new perspective that can inform the stakeholders involved, from policymakers to artists, on the topic, given the need to continue fostering both human- and AI-generated art, in line with the goal of copyright, that is, "to advance the progress of (…) useful arts."[10]

The article is structured as follows: in Section 1, we provide the main creativity theories from the field of psychology, and the knowledge of creativity from neuroscience, including its limitations to date. We use materials that allow us to answer the questions: "why and how do we create?". In Section 2, we use such knowledge compare the functioning of a creative brain with the functioning of an AI that generates art, Deep Dream. We compare two versions of "Starry Night" as example, one generated by Deep Dream (Figure 1), and the renowned one from Vincent Van Gogh (Figure 2). In Section 3, we refer to the originality standards in United States and in the EU using the landmark cases *Feist*[11] and *Infopaq*,[12] to evaluate whether AI-generated works could attract copyright protection. In Section 4, we discuss the alleged capacity of an AI to generate derivative "works." In Section 5, we build on the comparison made in Section 2 to discuss the alleged algorithmic infringement of copyrighted works. The article concludes by suggesting ideas for future research in the field, aimed at building "a bridge over troubled water" of copyright for both AI developers and human artists.

2 | "WHERE IS MY MIND?" CREATIVE PROCESSES TO FIND

In this part, we provide a recap of the main creativity theories from the field of psychology, and the state of the art regarding creativity knowledge in neuroscience (including limitations), to answer questions that are needed to inform our argument. Psychological theories of creativity could be deemed foundational to the current copyright

FIGURE 1 AI-generated art using "Starry night" as a prompt via DeepDream. [Color figure can be viewed at wileyonlinelibrary.com]

FIGURE 2 Vincent Van Gogh's "Starry night." [Color figure can be viewed at wileyonlinelibrary.com]

law system, as they provide crucial insights into the nature of creativity, which is central to copyright protection. These theories, emphasizing individual effort, talent, and expression, align with the legal view that originality stems from human-centric and individualistic endeavors (author's own intellectual creation). Consequently, they can be used to discuss what constitutes original work within the scope of copyright law.[13] Additionally, applying these theories to AI helps clarify whether and how AI's creative process parallels human creativity. This is crucial for addressing questions of originality and infringement, as current legal definitions are primarily based on human-centric models of creativity. First, we use 10 theories as exposed by J. Kaufman and Glăveanu in Overview of Creativity Theories.[14] We start by asking the questions of the Four P framework proposed by Rhodes (1961),[15] who synthesized everything into four primary categories, known as the Four P's: Person, Product, Process, and Press (i.e., environment). The Four P's represent four possible questions: What type of person is creative? What is considered to be creative? How do we create? How does the environment shape creativity? These ten theories provide different answers to such a question.

(1) The Componential Model of Creativity, proposed by Amabile in 1983 and 1996, suggests that creativity is a result of three inter-connected variables. The first is domain-relevant skills, which refer to technical abilities, talents and specific knowledge. The second variable is creativity-relevant processes, which includes traits such as tolerance of ambiguity and a willingness to take risks. The final variable is intrinsic motivation, which means participating in an activity because it is enjoyable or meaningful. Extrinsic motivation, in contrast, is when an individual is driven by external factors such as money, grades, or praise.[16] This model can be used to argue that AI, equipped with extensive data (domain-relevant skills) and programmed with complex algorithms to mimic human-like creative processes, can also be intrinsically "motivated" by its design objectives and custom, challenging the notion that intrinsic motivation is exclusively human.[17]

(2) The Investment Theory of Creativity, proposed by Sternberg and Lubart in 1995, compares creativity to financial investment. According to this theory, to be creative, one must be able to recognize undervalued ideas, convince others of their worth, and move on to new projects. They also identify six components that must align with creative values: motivation, intelligence, knowledge, personality, thinking styles, and environment. Additionally, the theory posits that a key aspect of being a successful creator is the willingness to challenge the status quo, or "defy the crowd." Sternberg later expanded on this concept in his Triangular Theory of Creativity, which argues that creative individuals must not only challenge others' beliefs but also their own and challenge the existing shared assumptions in their field.[18] In the context of AI, this theory might be paralleled with AI systems that are designed to identify underexplored ideas in large datasets. AI's "investment" in creativity could be seen in its algorithmic ability to diverge from standard patterns and generate novel outputs. However, since AI lacks the intrinsic quality of challenging personal beliefs or societal norms, this raises questions about the nature of AI's "investment." Indeed, AI-generated works may not stem from conscious "defiance of the crowd," but they introduce new elements into the creative discourse.

(3) Gruber's Evolving Systems Approach, presented in 1988 and 1999, conceptualizes creativity as the need to answer questions that spark curiosity in the creator. This theory looks at creative work as a process that unfolds over time, and examines the relationship between knowledge, emotion, and purpose in creativity. The goal of this approach is to understand what drives creators to be passionate about their work.[19] In relation to AI, this can be seen in how AI systems learn and adapt over time, developing and refining their output based on training data. This continuous evolution of AI can be viewed as a parallel to the human creative process, where new ideas and expressions emerge over time. However, AI lacks the inner passion and curiosity that typically drive human creativity, raising questions about the originality of AI-generated works.

(4) Csikszentmihalyi's (1996) optimal experience also focuses on the passional side of creativity, better known as flow. According to such theory, when people are engaged in a favorite and challenging activity, they are absorbed and in a state of exhilaration. This sensation, called Flow, is rewarding by itself, and people may be creative to experience these feelings, not necessarily to achieve a specific end goal or for an external reason.[20] There can be no doubt that AI is not subject to such—humancentric—notion of "flow." However, it is possible to let AI work in a metaphorical zone of optimal performance named "critical prompting.[21]" This simulates the human "flow state" while also raising considerations regarding the creative output in such synthetic "flow."

(5) The Matrix Model, developed by Unsworth in 2001, is a motivational theory from industrial/organizational psychology. This model focuses on the motivation and context of the problem being solved. It divides motivation into intrinsic (enjoyment-driven) or extrinsic (reward-driven) and the problem into open or closed. Based on these two factors, it suggests four types of creativity: responsive creativity, in which an individual does a specific task for an extrinsic reason, expected creativity, in which an individual is asked to be creative but with an external motivation, contributory creativity, in which an individual is engaged and interested in the task but with a specific, often narrow problem, and proactive creativity, in which an individual creates for their own reasons and specifications, which is considered to be the most similar to common perceptions of creativity.[22] For AI, creativity is exclusively driven by extrinsic factors such as tasks or goals set by the

programmers or prompters. If it is true that programming architecture can deliver a "proactively creative" AI, it is also true that AI does not engage in creative thinking driven by internal motivation.

(6) In his book "The Art of Thought," Wallas (1926) presents a model of the cognitive creative process that is still widely used today. The model includes five stages: preparation, in which the individual studies and gathers knowledge; incubation, in which the individual continues to think about the problem even when not actively working on it; intimation, which is often omitted from modern perspectives, but refers to the moment of realizing a breakthrough is imminent; illumination, in which the individual has the "a-ha" moment of insight and comes up with a solution; and verification, in which the idea is tested, refined, and put into practice.[23] In this scenario, AI's processing seems parallel stages of the Wallas' model: it gathers data (preparation), it processes it (incubation), and generates outputs (illumination and verification). Subsequently, despite the absence of human-like intuition or emotional engagement, AI seems mimicking certain areas of human cognitive process.

(7) Guilford's (1950, 1967) Structure of Intellect model is primarily an intelligence theory but it also includes a significant focus on creativity. This model proposes two types of thinking: divergent thinking, which is the ability to generate multiple ideas and solutions to open-ended questions or problems, and convergent thinking, which is the ability to select the most valuable idea or answer. These two types of thinking are also referred to as idea generation and idea selection.[24] This model can be applied to AI systems. In fact, AI—through algorithm—can execute both divergent (producing numerous potential solutions) and convergent (selecting the most effective solutions) thinking. In this sense, AI seems featured by "creative freedom"; a crucial legal component of originality.[25]

(8) The Geneplore (Generate-Explore) model, proposed by Finke, Ward, and Smith in 1992, builds upon Guilford's original concepts of idea generation and evaluation. It includes two phases: the first is the generative phase, in which the individual develops mental representations of potential solutions, referred to as preinventive structures. In the second, exploratory phase, these structures are evaluated in terms of their ability to meet the constraints of the goal. This process may involve multiple cycles before a workable and creative solution is identified.[26] In AI, while the initial analysis of data (e.g., such as pixel analysis) may represent the generative phase, the exploratory phase is represented by the generation of output based on this analysis. In this case, AI seems able to engage in creative process that can be both original and transformative.

(9) Mednick's (1962) associative theory focuses on the ability to make connections between seemingly unrelated concepts or ideas. According to this theory, a more creative person would be able to generate a wide range of related words that are less commonly associated when presented with a specific word. For example, when given the word "milk," a person with this ability might come up with more remote associations such as "mustache" or "Jersey" (breed of cow) in addition to more common associations such as "cow" or "white." It is worth noting that this ability is heavily dependent on one's knowledge, intelligence, and cultural background as stated by Kaufman in 2016.[27] AI, through neural networks and unsupervised learning,[28] can generate connections among remote or unrelated concepts. By doing so, AI can create novel associations similar to human creativity. However, this raises doubts in assessing whether these associations, derived from training data, constitute infringement of existing works.

(10) Glăveanu (2015b) proposed the Perspectival Model, which suggests that understanding different perspectives on a situation or problem is key to creativity. This model conceptualizes creativity as a dialogue between different perspectives and the ability to reflect on one's own view from the perspective of others. The ability to take on different perspectives and reflect on one's own views, known as perspective-taking and reflexivity, are developed through social interactions and when fostered within groups, can lead to greater productivity.[29] In AI context, the Glăveanu's perspectival model seems to suggest that AI-generated works can reflect various human perspectives thanks to AI's capacity to assimilate and learn from various styles present in the training data. However, questions arise whether AI's assimilation of perspectives/styles implies the mirroring of the creativity of human-derived training data.[30] This means that AI's output could infringe upon the existing copyright of the styles and viewpoints in its training data.[31]

After providing an overview of creativity theories from psychology, we now report notions and theories from the field of neuroscience, to shed light about the extent to which we understand the mechanisms of a creative brain. We will here refer to the research of Fink and Benedek (2019) on "The neuroscience of creativity," and to the interview "The Neuroscience of Creativity: The latest state of the field of the neuroscience of creativity—A Q&A with Anna Abraham."[32]

Relevant neuroscience findings suggest that creative cognition requires a conglomerate of neurocognitive processes involving executive functions, memory processes, internally focused attention, or spontaneous modes of thought. Studies investigating creativity in more naturalistic, real-life settings reveal some overlap with conventional creative ideation, but also indicate that creativity and its underlying neural mechanisms are specific to the particular domain.[33]

Neuroscience studies on creativity focus on investigating the cognitive processes involved in creative cognition (Ward, 2007). The research in this field typically looks into the neurocognitive processes involved in creative idea generation, divergent thinking, and creative problem solving. Tasks such as the Alternative Uses Task and the Compound Remote Associates Task are widely used to measure creative potential by assessing ideational fluency, flexibility of thinking, and originality of ideas.[34] Studies have found that creative cognition is associated with activity patterns in widespread neural networks supporting executive functions, memory processes, and spontaneous modes of thought. Additionally, more creative people tend to have stronger functional connectivity between different creativity-related neural circuits, indicating that higher creative ability is linked with an ability to simultaneously recruit different brain circuits to a greater degree.[35] These findings suggest that creative cognition requires a conglomerate of neurocognitive processes that are well integrated into normal cognition.[36]

The understanding of how the brain functions in relation to creativity is limited. Many studies on creativity in neuroscience use functional magnetic resonance imaging (fMRI) or electroencephalography (EEG) to measure brain activity, however, these methods have their limitations and it is difficult to transfer creative activities like writing, dancing or painting to a laboratory setting. Additionally, creativity cannot be prompted, and it is difficult to pinpoint the specific function of the frontal lobe in relation to creativity as it is a complex structure and damage to different parts of it can result in both disadvantages and advantages in creative performance.[37] Also, it is still not clear how the brain operates in a creative mode as opposed to an uncreative mode, and while there is more knowledge about the receptive-predictive cycle of the brain during the uncreative mode, less is known about the explorative-generative cycle that is in place during the creative mode.

When comparing previous insights with AI, it is possible to identify similarities and differences. For instance, AI, in its current state, can imitate certain psycho-cognitive processes, such as patterns recognitions, flow, creative freedom, data processing, generational thinking, and so on. However, as already mentioned, AI does not present that human-oriented holistic integration of psycho-cognitive processes.[38] Indeed, AI's capacity to generate genuine original work seems limited by its incapacity to replicate the full range of spontaneous cognitive processes featuring human creativity. Therefore, if AI outputs are nothing more than result of an algorithmic reconstruction of human-created works, they might be observed as derivative, thus raising doubts about their originality and infringing nature. As we further examine the mechanisms through which AI processes information and delivers creative outputs, we must continually bear in mind this critical divergences.

3 | "I'M ONLY HUMAN AFTER ALL"—ALGORITHMIC AND HUMAN CREATIVITY'S WALL

Creative thinking involves the discovery of novel connections and is therefore tied intimately to learning. Arthur Koestler said: "Creative activity is a type of learning process where the teacher and pupil are located in the same individual.[39]" In this sense, the fact that AI-generated art is the result of learning and processing training data, as well as elaborating new results by studying the patterns in those data (as it happens with Diffusion) proves that the

creativity patterns in AI are not distant from those in humans. In this paragraph, we are going to consider our DeepDream-generated "Starry night" and the Van Gogh's "Starry Night."

Let's analyze how DeepDream works, first. The text 2 Dream tool can generate amazing art and photorealistic images from just a text prompt or a combination of a text prompt + base image. The tool is based on the Stable Diffusion deep learning, text to image model. Text-to-Image AI recently saw a major breakthrough with the release of Dall-E and its open-source counterpart, Stable Diffusion. These programs allow anyone to create original visual art pieces by simply providing descriptions in natural language (prompts).[40] Stable Diffusion is a latent diffusion model, a variety of deep generative neural network. Diffusion models are machine learning systems that are trained to denoise random Gaussian noise step by step, to get to a sample of interest, such as an image. Diffusion models have shown to achieve state-of-the-art results for generating image data (Figure 3).

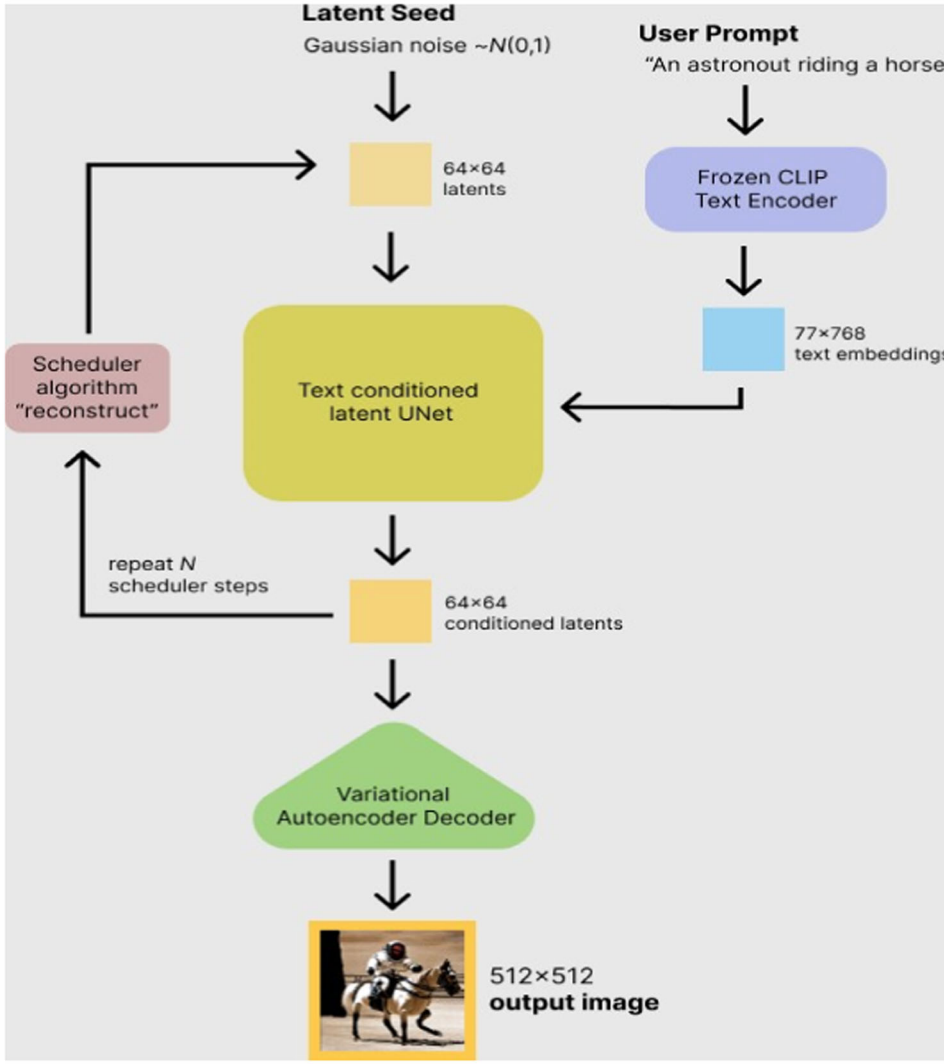

FIGURE 3 Latent diffusion model, from https://huggingface.co/blog/stable_diffusion. [Color figure can be viewed at wileyonlinelibrary.com]

Latent diffusion is a technique that reduces the computational complexity and memory requirements of image generation by applying the diffusion process in a lower-dimensional latent space, instead of using the actual pixel space. The method involves three main components: an autoencoder (VAE) to convert images into a low-dimensional latent representation, a U-Net to denoise the latent representation, and a text-encoder to condition the U-Net's output on text prompts. The VAE encoder and U-Net encoder both compress the image representation and the U-Net decoder and VAE decoder both decode the image representation back to original resolution. The text-encoder converts the input text prompt into embeddings that the U-Net can understand. Using this technique, the memory and compute requirements are greatly reduced compared to pixel-space diffusion models. In inference, the model takes a latent seed and a text prompt as input, generates random latent image representations and text embeddings, and uses a U-Net to denoise the image while being conditioned on the text embeddings.[41]

Deep Dream Generator also uses AI to blend two images or to provide "deep style." We refer to the description of[42]: DeepDream uses a trained convolutional neural network (CNN) to generate a transformed version of a source image, emphasizing certain visual qualities based on a guide image. The algorithm starts by analyzing the guide image and propagating it from the lowest layer to a chosen higher layer, which encodes the image in terms of increasingly abstract features. This encoding is stored as a guide feature vector. Then the algorithm initializes the source image, referred to as the canvas image, and gradually transforms it into the output image. The canvas image is propagated through the network to the same layer as the guide feature vector, yielding a canvas feature vector. A loss function is used to measure the difference between the two feature vectors, and a gradient is found and back-propagated to the lowest layer. This process is repeated, and the pixel values are updated. The original guided DeepDream algorithm maximizes the dot product between source and guide features, which can result in exaggerated or "hallucinatory" appearances.[43] However, variations on the algorithm can be used to minimize the distance between source and guide features, producing "tamer" output imagery. To blend two images, DeepDream first generalizes each image by propagating it through a deep CNN and representing it according to a certain network layer, depending on the similarity between the guide and source images as viewed from that layer encoding. The nature of the layer encoding depends on both the network architecture and the original training data. The algorithm uses a reiterative two-phase creative process of alternating divergence and convergence to enhance similarity between the source image and the guide.[44]

Let's now move to compare AI and human creativity. We have seen that our Starry night derived from multiple layers, that is, a multiple actions are involved in human and this is true for both AI and human creativity. For what concerns the AI, we know that the process started with an external impulse, thst is, the text prompt Starry Night. For what concerns Van Gogh, we know that he painted it during his days at the asylum, and that it was the nocturnal view of his bedroom. Thus, we can deduce that the input might have been an internal urge to paint, and the "prompt" of starry night might derived from his surrounding environment.

One could say that the main difference is that in DeepDream's Starry night we have commissioned a title, and the AI has produced an output that corresponded to that title. In Van Gogh's Starry Night, it is probable that the artist has first painted the landscape, and then named it so that it could be represented in words. However, we also know that Van Gogh wrote to Theo, his brother, "This morning I saw the countryside from my window a long time before sunrise with nothing but the morning star, which looked very big" and researchers found out that Venus (often referred to as the "morning star") was indeed visible at dawn in Provence in the spring of 1889, and was at that time nearly as bright as possible. So the brightest "star" in the painting, just to the viewer's right of the cypress tree, is actually Venus."[45] In this sense, we could argue that even in Van Gogh's Starry Night, the creative endeavor of the artist took inspiration from an external input, that is, the starry night, not in textual form but in visual form.

Moreover, Van Gogh argued with Bernard and especially Paul Gauguin as to whether one should paint from nature, as Van Gogh preferred, or paint what Gauguin called "abstractions": paintings conceived in the imagination.

Both humans and AI create from both: text for AI, and abstractions for humans are potential inputs for a painting. Training data is necessary for AI to create. Different types of training data such as the environment, experiences, memories, emotions, surroundings are necessary for artists to create too. In other words, for both AI and humanity, the absence of training inputs determines the non-existence of the creative output.

In the letter to Bernard, Van Gogh says: "When Gauguin was in Arles, I once or twice allowed myself to be led astray into abstraction, as you know But that was delusion, dear friend, and one soon comes up against a brick wall. And yet, once again I allowed myself to be led astray into reaching for stars that are too big—another failure—and I have had my fill of that." Van Gogh here is referring to the expressionistic swirls which dominate the upper center portion of The Starry Night. By stating that he tried the abstraction method in Starry Night, one could argue that both our DeepDream Starry Night and Van Gogh's Starry Night originated from an abstract idea.[46]

For wat concerns the creative process, we know that both the AI and Van Gogh took inspiration from other images and paintings. DeepDream was able to create by analyzing images at pixel level, creating its own style by having learned from those of others, and derived visual representations from its "memory" and "skills." Van Gogh could not paint in his bedroom, where the view of Starry Night is from, he had to paint from a studio on the ground floor of the building. Therefore, he also used both his memory and the sketches of the view to create his own Starry Night.[47] Also, his painting style is the result of his painting career, that began by learning from others and developed by experimenting his own original style. Similarly, DeepDream learned from training data and images, and the neural network used to generate a certain style produces an output which is the result of a determined set of styles learned by the AI at pixel level.

A difference between AI's and human's creativity also lays in the ability to carry on despite malfunctioning. With DeepDream, one can say that if the algorithm does not work, it cannot create. Oppositely, a thought-provoking finding is the brain's ability to engage in creative pursuits despite disorder and degeneration at the neural level. Van Gogh was in asylum and he had experienced mental disease, however he was able to paint. This could attest to the disorder-resistant power of the brain in enabling self-expression and communication, as expressed by Kaufman.[48]

Please refer to Table 1 in relation to differences and similarities between human and AI creativity, in relation to the psychology theories and neuroscientific knowledge exposed in Section 2. As evident from the Table, most of the notions, acts, and tasks associated with human creativity are also applicable to AI creativity. The main differences we found lay with the following aspects. First, AI lacks inner motivation to be creative. Second, AI cannot experience the feeling of imminent breakthrough like humans enjoy it as relief and illumination. Third, AI cannot create because of the mere feeling of experiencing a flow of creation without a scope or a purpose.

There are some common limitations to AI and human creativity. Often, AI internal processes are so-called "black box," that is, the layers of apprenticeships are so many and so dense, that the logic used by the AI to produce a certain output cannot be traced back. In this sense, it is still possible to draw a parallel with the numerous limitations of our understanding of the creative brain, as highlighted in the previous paragraph.[49] Among others, it is difficult for neuroscientists to determine which aspects of a domain are creative and which ones are ordinary. This is particularly true, for example, in the domain of music and musicality, where there can be a distinction between the formats of listening, performance, improvisation and composition. Adopting a standard definition of creativity, improvisation and composition would be considered the most creative forms, but not all improvisation is necessarily creative. And the same could be said for AI-generated works: improvising does not necessarily equate to creativity but discerning among the two in machine learning is particularly difficult. There is also good reason to consider musical performance as a creative endeavor because of the potential for originality in interpretation and expression. However, the brain basis of creativity in distinct creative domains is still not well understood. This is primarily because there are challenges in examining these forms of creativity, such as gross or fine motor action and the extended and variable periods of time involved in creating a work of art, a skillful performance, or a novel scientific theory.

TABLE 1 Differences and similarities between AI and human creativity.

(1) Componential Model of Creativity (Amabile, 1983, 1996)	Similarities: Domain-relevant AI (Deepdream: visual art)—technical skills, talent and specific knowledge: training data from Stable Diffusion. Differences: no intrinsic motivation or willingness to take risks.
(2) Investment Theory of Creativity (Sternberg & Lubart, 1995)	motivation: partly similar (only external) - knowledge: training data - personality and thinking style: algorithmic creativity - environment: text prompt. Differences: no internal motivation, no ability to defy his own beliefs or the crowd
(3) Gruber's (1988; Gruber & Wallace, 1999) Evolving Systems Approach	Similarities: knowledge (training data), affect (output), purpose (text prompt). Differences: no inner passion.
(4) Csikszentmihalyi's (1996) flow	Similarities: none. Difference: no inner flow or absorption or experience creativity without a specific end.
(5) the Matrix Model (Unsworth, 2001)	Similarities: motivation and context: prompt (problem to be solved). Extrinsic reason: reward. Differences: no contributory or proactive creativity)
(6) Wallas (1926), in The Art of Thought, model of the cognitive creative process.	Similarities: preparation: training data - incubation: processing: intimation and illumination: output. Verification: validation. Differences: no internal output.
(7) Guilford's (1950, 1967) Structure of Intellect model	Similarities: different types of machine learning can perform divergent and convergent thinking.
(8) The Geneplore (Generate-Explore) model (Finke et al., 1992)	Generative phase: analysis of pixels, explorative phase: generation of output.
(9) Mednick's (1962) associative theory	Connection between remote concepts: neural networks and black box AI. Unsupervised learning.
(10) Glăveanu's (2015b) Perspectival Model	Perspective taking: training data, learning from different styles.
A conglomerate of neurocognitive processes involving **executive functions, memory processes, internally-focused attention, or spontaneous modes of thought**.	Convolutional neural networks
Neuroscience studies on creativity concerned with investigating the cognitive processes implicated in creativity (**creative cognition)** (Ward, 2007). The investigation of neurocognitive processes involved in **creative idea generation or in divergent thinking** (i.e., generating different creative solutions to open-ended problems), and in **creative problem solving or insight problem solving** (Benedek & Fink, 2018). Divergent thinking task (Alternative Uses Task): people to generate as many and as original uses for everyday objects.	Similarities: different types of machine learning can perform divergent and convergent thinking. Decision-making algorithms.
Tasks for the assessment of insightful problem solving: reframing or **restructuring of existing mental representations**, associated with the **subjective experience of a sudden breakthrough** (experience of "AHA"; Bowden et al.,	Similarities: text prompt and association based on training data. Difference: no inner feeling of breakthrough but rather completion of output

(Continues)

2005; Kounios & Beeman, 2009; Sandkühler & Bhattacharya, 2008). Compound remote associates task, stimulus presented (e.g., boot, summer, ground) and participants required to find a word that forms a compound ("camp") between the three stimulus words (example taken from Bowden et al., 2005).	
Creative cognition associated with **activity patterns in widespread neural networks supporting executive functions** (e.g., fluency, flexibility of thinking, inhibition of prepotent responses, etc.), **memory processes, internally-focused attention, or spontaneous modes of thought** (e.g., Beaty et al., 2019; Boccia et al., 2015; Fink & Benedek, 2014; Gonen-Yaacovi et al., 2013). Creative cognition and the need of a **conglomerate of neurocognitive processes that could be well integrated into "normal" cognition** (Benedek & Fink, 2019). For example, **envisioning possible improvements to products, requires memory processes to build novel representations of these products, sustained internally- oriented attention to guide active imagination, and vigorous executive control to realize effective and useful task solutions by evaluating/elaborating preliminary thinking results, and by inhibiting prepotent/conventional responses**.	Similarities: creativity as a conglomerate of processes. Possible improvements: automatable. Memory processing (based on training data). Attention to perform the task. Evaluating preliminary results: automatable. Difference: internally-oriented attention to guide active imagination.
Creativity characterized by **stronger functional connectivity between different creativity-related neural circuits**, possibly indicating that higher creative ability is linked with an **ability to simultaneously recruit different brain circuits to a greater degree than in less creative people**	Convolutional neural networks and black box AI."

4 | "JUST MY IMAGINATION"—COPYRIGHT'S PROTECTION FOR AI CREATION

This section delves into the concept of originality. Originality, as foundational principle of copyright law, refers to human creativity and the expression of ideas. In this sense, it represents the mechanism through which the abstract concept of creativity is codified into enforceable legal standards.[50] Therefore, as this paper aims to contribute to the debate about human and artificial creativity using insights from Section 1 and the previous chart, it seems necessary to include originality in such discourse. Indeed, through the examination of psycho-cognitive basis of creativity, it is possible to assess whether AI-generated works meet the threshold of originality as defined in current copyright law. Based on previous paragraphs, it is possible to argue that Deep Dream deploys a set of creative choices that are not under control of its programmers. In other words, the creative spark comes from the machine. The fact that machines are now generating truly creative works persuades us to rethink the traditional structure of copyright law.[51] Copyright was designed to offer protection to humans' intellectual creations, leaving no space for nonhuman intellectual works.[52] Despite the human-centric approach of intellectual property, works like "The Starry Night" (Figure 1) have the potential to challenge what we consider original; which is one of the main requirements of copyright protection.[53] For instance, the US standard for originality is to be found in *Feist* where the US Supreme Court had to decide whether a phone directory was original. In deciding this case, the Court distanced itself from

the prevalent principle of the "sweat of brow" that allowed copyright protection of a compilation if enough efforts have been deployed in the creation of the compilation, even though the single elements cannot attract copyright protection.[54] Indeed, in *Feist*, the Court affirmed that "100 uncopyrightable facts do not magically change their status when gathered together in one place.[55]" The Court held that "[a]s a constitutional matter, copyright protects only those constituent elements of a work that possess more than a de minimis quantum of creativity.[56]" In other words, to attract copyright protection, a work must present "a modicum of creativity.[57]" Hence the potential relevance of the analysis of creativity theories, based on which the similarities between humans' and AI's creativity seem to be sufficient to suggest that AI-generated art should be eligible for copyright protection. If we unpack the process of AI creativity, as we have done in the previous section, we can see that it fits in major psychology creativity theories, and even in neuroscience research, the variety of processes performed by our brains when they create seem to be similar to the AI's ones. AI-generated art is, indeed, the result of a synthetic creative process. What is missing in AI's creativity is the inner motivation, the flow, the emotions of creating, and the enjoyment of creating for the sake of it, without the need to produce a certain output. However, even with latent diffusion there is a text prompt sent to the AI by a human, hence one could argue that the entire line of the creative process is met, and it is shared between the human who inserts the prompt and the AI. In this sense, future research should focus on shared authorship or similar options that can address the link between the creativity of the human input and the AI creative output. In another paper, for example, the link between originality in text prompts and output is addressed, on the basis of the idea-expression dichotomy (*reference anonymized*), and the uniqueness of one output (as the selected result among many potential choices) in relation to a text prompt is considered as a viable solution to claim authorship.

In the EU, the landmark decision of the Court of Justice of the European Union (CJEU) concerning originality is *Infopaq*, that sets the standard as "author's own intellectual creation." The CJEU further elaborated upon the notion of "author's own intellectual creation" in other decisions, for example BSA, C-393/09; FAPL, C-403/08 and C-429/08; and *Painer*, C-145/10. The EU standard requires the making of "free and creative choices" and that the work carries the "personal touch" of its author. In *Football Dataco*, C-604/10 Advocate General (AG) Mengozzi also stated that the EU standard requires a "creative" aspect, and it is not sufficient that the creation of a work has required labor and skill.[58] In other words, European concept of originality—and subsequent copyright protection—requires author's free choices featured by some personal touch. In this sense, it is easy to see how a definition of originality so incapsulated within personal creativity might be problematic for creative works generated by advanced AI.[59] For instance, with *Infopaq* the Court made clear that the selection process could be a relevant aspect to take into consideration. In fact, "[…] It is only through the choice, sequence and combination of those words that the author may express his creativity in an original manner and achieve a result which is an intellectual creation."[60] Even though *Infopaq* refers to words, the CJEU delivered a similar analysis in relation to other types of works. In *Painer* the Court claimed that the preparation phase of taking a photograph, the development choices and even postproduction decisions would give rise to originality since they reflect "author's free and creative choices in the creation of a photograph."[61] Under these circumstances, our Starry Night (Figure 1) seems to present a free selection process where the outcome is unpredictable and whose esthetics are a direct result of the decisions made by the algorithm, based on the text prompts.[62] Therefore, we could argue that, even in this case, the standard of originality is met, since the author's text prompt (and eventual adjustments of the algorithmic criteria, that are possible in DeepDream) can be seen as the author's touch, and the creative endeavor is once again shared between the AI and the human. Contrarily to what Gervais stated,[63] we argue that the AI does not break the link between humans and final output: the human input is indeed determinant and necessary to achieve the output. "The human artist, as the author, is always the mastermind behind the work, and the computer is a tool. However, AI technology is not like traditional tools. Its randomness changes the way humans control it. As a sparking trigger of inspiration, artists collaborate with AI agencies to augment the artistic process. As for text-based generative art, it is also argued that creativity does not lie in the final artifact but rather in the interaction with the AI and the practices that may arise from the human–AI interaction.[64]"

Therefore, it is possible to argue that AI-generated artworks meet the threshold for EU's copyright originality where free decisions, and the combination of choices may warrant originality. In the United States, *Feist* seems denying originality and subsequent copyright protection to informational works that arise from mere selections, free decisions or arrangement of choices. Even though our Starry Night is a visual work, it might not be able to attract copyright protection if the only focus is on algorithmic choices.[65] Moreover, the US copyright office clearly states that works "that have not been created by a human being[66]" do not satisfy the requirement for copyright protection. In other words, in case a visual work originates from an artificial intelligence, the alleged creative spark is voided.

While in Van Gogh's Starry Night the creative process is entirely performed by the author, our Starry Night is the result of the creative process of AI and our input to create a new creative version of a work of art with that title. The collaboration between humans and AI seems to perfectly mimic the human artistic process. In details, the synthetic creative process behind our Starry Night seems to be mostly aligned with previous psycho-cognitive theories featured by -substantial-difference. For instance, our Starry Night mirrors both Amabile and Sternberg and Lubart's creativity model as a combination of expertise, knowledge and thinking style. However, it struggles to mimic the intrinsic motivation of creativity and its propension to challenge the status quo.[67] Similarly, in the Gruber's evolving system approach context, synthetic creativity can adapt and evolve over time through training data. However, it lacks of inner passion.[68] Also, in the optimal experience model our Starry Night can't be observed as the result of an inner flow or absorption due to AI's inevitable incapacity to process those human feelings.[69] Again, if it is true that our Starry Night is the result of an extrinsic creative motivation posed by the prompt, it is also true that AI cannot engage in proactive creativity.[70] According to Wallas' though, the creative process behind our Starry Night mirrors the human one by reflecting the preparation, incubation, and verification stages.[71] In the context of Guilford's structure of intellect, our Starry Night is a clear example of both divergent (the proposal of various solutions) and convergent (opting for the most suited solution) thinking.[72] According to Geneplore model, the AI's process in creating our Starry Night involves the generation of new artistic ideas featured by further— algorithmic—manipulation to produce the final image.[73] Last, according to Mednick, the creation of our Starry Night may reflect AI's ability—through unsupervised learning—to make connections between unrelated concepts or ideas and thus recreate new associations; exactly like human creativity.[74] Under these circumstances, it is interesting to observe whether current legal notions of originality and artificial creativity can coexist within the same psycho-cognitive framework. On the one hand,. the legal requirement of "a modicum of creativity" in the United States and the EU's stipulation for "authors' own intellectual creation" can be juxtaposed against previous psycho-cognitive theories. For instance, the US standard seems echoing Mednick's theory, where creativity arises from new combinations of ideas.[75] This might suggest that even a "modicum" amount of creativity could trigger the pyshco-cognitive process. On the other hand, "authors' personal touch and creative freedom" resonates with Guilford's theory, which emphasizes the divergent thinking in the creative process.

Exploring the intersections between legal notions of originality with psycho-cognitive framework reveals important takeaways. Artificial creativity emerges from algorithms, neural networks, and data patterns, all replicating a robust amount of human creative process. On the contrary, human creativity is often rooted in personal experiences, emotions, and sophisticated cognitive process which are not easily replicable by AI. However, it is undeniable that AI's creativity develops along those human creativity coordinates that—directly or indirectly—informed the legal definition of originality in copyright:.[76] Also, when artificial and human creativity meet, it creates a unique synergy where algorithms and data patterns intersect with human motivation, flow or proactive thinking. This convergence, while expanding our understanding of creativity and originality, encourages a re-evaluation of the legal framework that deals with the evolving nature of creative expressions.

5 | "TIME IS LIMITED, WE'RE ALL DERIVATIVE"—DERIVATIVE SHORTCOMINGS IN COPYRIGHT LAW

The previous section briefly discussed how artificial creativity can challenge current copyright law in relation to the legal requirement of originality. If it is true that, to some extent, creativity has been brought into the originality equation as character of the author' choices during the creation process, it is also true that creativity does not encompass originality only. On this regard, Andersen complaint states that:

> *The resulting image is necessarily a* ***derivative work****, because it is generated exclusively from a combination of the conditioning data and the latent images, all of which are copies of copyrighted images. It is, in short, a 21st-century collage tool.*[77]

Therefore, it seems relevant to discuss the psycho-cognitive notions in relation to the AI's capacity to generate derivative work or, more in general, its capacity to infringe copyright. Leaving aside the predictable legal trend over the extension of the derivative work right to prevent the use of, or claim protection for, AI assisted artistic production[78]; the paragraph suggests a further element. Specifically, AI assisted outputs—even if they might not be able to attract copyright protection—can infringe copyright. This seems clear by observing AI's copyright infringement capacity under the psycho-cognitive framework previously used to compare the AI's capacity to create original works. In essence, the lack of human-like experiences, emotions, and sophisticated cognitive processes in AI seems to suggest that its outputs, lacking these human qualities, are inherently derivative in nature. For instance, according to Amabile's model, AI's lack of creative-thinking skills may place its outputs more as derivative works, thus infringing copyright holders' right. In the context of the Sternberg and Lubart's investment theory, AI's capacity to process and recombine patterns might be observed as an "investment" in existing expressions to be transformed into something inevitably derivative. Consequently, the capacity of AI to deduce links between unrelated ideas and form novel associations raises questions about whether these AI-generated connections, stemming from its training data, could potentially infringe the derivative work right.[79] Accordingly, this last concern regarding AI's ability to craft new expressions from disparate concepts, represents the standpoint of the plaintiff in the *Andersen* case.[80] However, as will be observed at the end of this section, AI's necessary attitude to infringe derivative work right might be seen as a by-product of current copyright legal framework.

Assuming AI's capacity to infringe copyright, it seems that AI generated creations can qualify both as "works" and "derivative." Is this a correct assumption? On this regard, the EU copyright *acquis* can inform a four-steps test that must be met for an AI-generated creation to qualify as a "work".[81] In details, the test includes the following stages: (a) Production in literary, artistic, or scientific domain, (b) Human intellectual effort, (c) Creativity and Originality, and (d) Expression.[82]

(a) *Production in literary, artistic, or scientific domain*

The current EU copyright law framework does not harmonize the concept of work of authorship in general terms. The closest definition is presented by the Term Directive that defines copyright subject matter as "a literary or artistic work within the meaning of Art.2(1) of the Berne Convention."[83] Also, the CJEU's jurisprudence seems to rely on the same Art. 2(1).[84] Therefore, from the definition of Art.2 follows the requirement that a creation, to be classified as a "work," must be produced within the "literary, artistic or scientific domain." As can be understood, AI systems are capable of generating almost the entire spectrum of works included within article 2(1) of the Berne Convention. For this reason, and assuming that the domain-based approach accounts for a prerequisite under EU copyright law,[85] AI-assisted creation will pass this initial step.

(b) *Human intellectual effort*

To qualify as a work, the AI-generated must also be the result of a human intellectual effort. On this regard, it might be argued that EU *acquis* seems suggesting that copyright only protects expression that originates from

a human entity. Indeed, even though EU copyright law does not expressly require a human creator, its "anthropocentric" nature is self-evident in many CJEU' decisions.[86] For instance, in *Painer*, the Court affirms that "by making various choices" the author can use his "personal touch".[87] Again, in *Cofemel*, the Court stated that "the subject matter reflects the personality of its author, as an expression of his free and creative choices.[88]" In conclusion, the human intellectual effort requirement cannot be met by those creations that are produced without any human intervention. However, the human intervention requirement does not automatically exclude AI-generated creations from being qualified as a work. This is confirmed by the opinion of the Advocate General Trstenjak where she concluded that *only human creations are therefore protected, which can also include those for which the person employs a technical aid, such as a camera*.[89] Subsequently, as long as the technical aid requires some form of human intervention, the creation in question would be considered a work and—if original—protected. On this regard, even though the connection between the users' intervention and the AI-generated outputs is increasingly remote, it is impossible to think about an AI-generated content that involves no human agency/intervention whatsoever.[90] The crucial point here is whether an AI machine can be categorized as a tool or technical aid and to what extent a natural person's involvement with AI-generated output—however remote such as the prompt—can generate an *intellectual* creation.

(c) Creativity and originality

As outlined in Section3, the most crucial element in relation to copyright protection is originality. In the EU, Beyond *Infopaq*'s "author own intellectual creation," the originality test is usually met when the author "was able to express his creative abilities in the production of the work by making free and creative choices."[91] Therefore, the attention lies on the existence of a creative space and choices, rather than on the creativity of the production process itself. Also, as confirmed by *Painer*, creativity in the context of machine-aided production may take place in three different stages of the creative process: conception, execution and redaction[92] (Figure 4).

The *conception* stage requires the author's elaboration of the plan or design of the future work. This usually goes beyond the formulation of general ideas about genre, style, format, and so on. Indeed, the conception stage involves the elaboration of conceptual choices such as the subject matter, plot (for a novel, or a film), melody, (for a musical work), or functional specifications (for a software or database).[93] In the context of AI-generated creation, the same conceptual choices may range from the choice of the AI system, the selection or curation of training data, or the writing of a specific prompt. With AI machines, previous choices will always be exercised by humans while the AI system itself will probably account as a constraint or limitation towards author's creative choices. This is relevant because, as confirmed by *Painer*, conceptual choices of the preproduction phase are crucial elements to identify original creations. However, previous psycho-cognitive framework delivers a scenario where AI does not necessarily account as a constraint. For instance, in the context of Walla's cognitive process model—AI is able to replicate the conception phase indicated in *Painer* through the preparation and incubation stages.[94] Additionally, the conception phase might be observed under Gruber's evolving systems approach where AI's ideas are the result of learning and adaptation based on training data. Moreover, when examining previous conceptual choices through the lens of convergent and divergent thinking, it becomes evident that AI, as conceptualized in Guilford's Structure of Intellect model, possesses the ability to execute these choices effectively.[95]

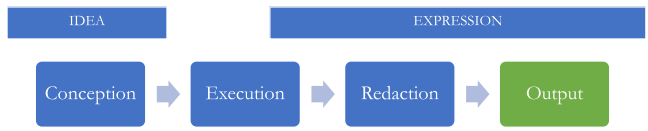

FIGURE 4 Scheme of the creative process. *Source*: Footnote 81. [Color figure can be viewed at wileyonlinelibrary.com]

The *execution* stage requires the author converting previous conceptual choices into a draft version of the final work.[96] Therefore, the author will convert the plot for a novel into words, will translate a melody into notes, or will reshape functional specification into lines of code. Even though the human role in the execution stage has always been crucial, from the 19th century machines played an increasingly important role in the creative processes.[97] However, the relationship between humans and their creation has always seen the human creator in control of the creative process. In fact, cameras, software, or recording devices were nothing more tools or technical aids that converted the authors' conceptual choices into a perceivable output. With AI machines, the nature of this relationship has changed, in degree if not in nature. Indeed, AI systems are able to convert the user's choices into outputs by performing production and creation tasks that are beyond her/his control. This is particularly true in the context of deep learning system such as DeepDream where the diverse neural networks create a greater distance between the user and the machine during the execution phase.[98] Although the AI systems have probably replaced human's role in the execution stage, this does not mean the user can be considered passive. In fact, the user is now more focused on monitoring and guiding the output process while adjusting parameters and functions. In other words, the user's role is more operational. However, this might require additional creative choices originating from the human user.

The *redaction* stage requires a further re-processing of the draft version created in the execution stage into the finalized version of the work. The range of activities involved in the redaction stage may vary depending on the subject matter, genre, or medium of the production process. In the context of the creativity, the redaction is often underestimated but it allows the author additional creative choices. This is again confirmed by the CJEU in *Painer* where it has been argued that final stage of the creative process may involve a certain amount of creative choices.[99] For instance, the French Court of Cassation accepted the copyright protection of maps because they were the result of personalization and improvement of choices in relation to colors, contrasts, and brightness.[100] Under this circumstance and depending on the selected AI system,[101] it is possible to foresee a role for the human creator. Indeed, although the human author has been largely replaced by AI machines in the execution stage, the human creator's role in the conception and redaction stages remain essential. Thus, the involvement of a human interpreter remains necessary during the *conception* stage, the adjustment of certain parameters during the *execution* stage, and the postproduction activities in the *redaction* stage. Subsequently, provided that a human creator has initiated and creatively reshaped the AI output, the cultural artifact generated with the assistance of an AI machine might be eligible for protection under EU copyright law. In essence, copyright protection should be satisfied every time human creator intervenes in the conception and redaction stages.[102]

(d) Expression

To qualify as a work, the human author's creativity shall be expressed in the final work. From this step it is possible to create the "general authorial intent" prerequisite, namely that the human author must have a general idea of the work before it is expressed. This requirement, however, might represent an issue for DeepDream where the "black box" phenomenon would prevent to the human creator to predict or having a general idea about the work. However, this should not represent an obstacle to qualify as "work" the final AI-assisted output provided that such output lies in the ambit of the human's general authorial intent. [103]

As regards AI-generated creation, none of previous four steps seem to pose obstacles to qualify them as works under EU copyright law. However, in the case of DeepDream and its increasing distance between the human user agency and the generated output, it will probably be hard to identify meaningful human author's contributions or choices in relation to conception, execution or redaction phases. This means that DeepDream-generated creation might not qualify as a "work" in the EU.

In the United States, the category of derivative works includes those creations that are "based upon one or more pre-existing works."[104] As regard EU copyright, the InfoSoc Directive does not make any reference to adaptation[105]; which has been instead harmonized in the context of the Database and Software directives.[106]

Subsequently, Member States have retained a certain competence to define adaptations. For instance, in France, a derivative work is defined as a "composite work," namely a new work in which a pre-existing work is incorporated.[107] Both these definitions can be used to inform AI-assisted artistic productions. In fact, machines such as DeepDream can generate artistic works that are *based upon* or *incorporated* on pre-existing creations. Early copyright law did not provide authors with the faculty of controlling creations based on their works.[108] While the law was silent about adaptations, courts addressed potential infringements by observing what the defendant added or contributed to the previous work.[109] However, the Romanticism's ideals changed this trend while glorifying authors' roles and their creative process. The author became a creator able to internalize the surrounding world and redeliver a new work to the society thanks to her/his creative genius.[110] Under the Romantic view where creativity exists before its fixation into a tangible work, authors increased the control towards the outcomes of their creative processes while copyright law changed the manners of how to address derivative works and adaptations. Rather than acknowledging the contributions of the second creator, Romantic copyright law started to observe what secondary authors took from the first author's genius. Therefore, one of the potential infringing dimensions of adaptations was the alleged capacity to substitute the original work in the market.[111] The romantic vision of derivative works then affected translation, dramatizations, performances and, a few 100 years later, AI-generated creations.[112] To claim that AI-generated creations are "necessarily derivative work" or "21st century collage" reveals an inaccurate and flawed narrative of the underlying technology. As Section 2 already outlined, the AI-generated output is the consequence of a multimodel process where a diffusion model is trained to reconstruct images thanks to the latent space and where a second model understands the images and their corresponding text description.[113] Therefore the combination of data processing, latent space and language models shows that an image generated by a text prompt can't be identified as a collage. In addition, one could say that the AI-generated creations can't be described as derivative because nothing has been added or done to the pre-existing work.[114] The machine does not add or derive, instead, it finds correlations and patterns as matrix for its own productions.[115] In other words, it is arguable that AI outputs can be considered derivative as much as trees painting created by a human after being exposed to protected visual material of trees, bushes, forests, and so on.

6 | "DON'T LET ME DOWN"—NEITHER AI DEVELOPERS' NOR AUTHORS' RIGHTS SHOULD DROWN

In this section, we aim to see how the analyzed creativity theories can help answering the question: is AI infringing existing copyrighted art? According to the artists who recently start a class action in California, yes. Their argument is that not only AI uses copyrighted material for its training, but also that the resulting output sometimes are visibly inspired by artists' personal styles.

We need to go back to the creative processes of humans and of latent diffusion to explain our perspective. If we start from Van Gogh, and we refer to the creativity theories, we will see that there are recurring elements that applies to AI too. In the human creative process, the person thinks about an innovative way to produce a product; uses its memory; incubates the idea; connects different neural circuits in his brains. The material he has available includes what he has seen before, landscapes as well as other people's art and style (even if he does not hold a copy of it). Probably in its output one can see the influence of painters of his time, and thanks to that some styles became famous, think about realism, impressionism, and so on. The copy and emulation of painting's style have always existed, and it actually contributes to the popularity of such style. The AI that we are analyzing does not do anything particularly different. In its creative process, it has available what it has seen (training data) and it does not hold a copy of it. It tries to produce an output in an innovative way based on such material, connecting the different dots provided by the inputs with the available material. Moreover, the claimants of Midjourney case argue that the outputs are all derivative works that infringe copyright. However, an artist that visits hundreds of galleries, museum, and studios will not necessarily produce infringing nor derivative outputs, even if memories and inspirations from

other works can play a fundamental role in the artist's creative process. Similarly, having trained the algorithm (that works with the same technology described in this paper, latent diffusion) on many data (it could be 5 million images, retaining billion images of related data points in the latent space but no single copy), it would seem unreasonable unjustified if to entitle each author of one of those 5 billion images could to claim copyright infringement for all the outputs resulting from the AI. We believe that for these reasons, it is arguable that latent diffusion does not necessarily infringe copyrighted works. In relation to the training, this is justified by the creative process. In relation to the output, this should be verified on a case by case basis with the tests for infringement, such as the substantial part standard.[116]

However, it is important to limit the relevance of our argument. Believing that AI training does not result necessarily in copyright infringement, does not mean that it is unreasonable to compensate artists and authors of works used in the training, for other policy reasons. As a matter of fact, the implications of using copyrighted material for AI training go beyond the question of infringement, and touch upon other questions such as impact on the job market, and remuneration for human creativity, to name a few. Therefore, the idea of a licensing system for the use of copyrighted material in AI training might be considered for reasons other than infringement, that are still within the scope and objective of the copyright system, such as incentivizing both human and artificial innovation.

An unclear regulatory approach might risk stifling innovation both in the field of AI and in human creativity. A legislation that does not accurately address the balance between copyright-stakeholders might negatively affect creative industries. Suggested solutions to the problem of AI training on copyrighted material vary from transparency requirements and licensing schemes to text and data mining (TDM) exceptions for AI.

In the EU, the risk of litigation related to the use of TDM on protected works or databases is not trivial, especially since the case law of the Court of Justice has historically interpreted the exclusive right of reproduction in a strict manner to ensure the widest possible protection for authors. This risk is not eliminated by the existence of the exceptions to copyright set out in the relevant European directives, because the adoption of many of these exceptions is fragmented and inconsistent, and because their applicability to the different phases of reproduction and processing of data carried out by TDM algorithms are difficult to trace unambiguously to their scope of operation. In the recent Copyright in the Digital Single Market Directive (CDSMD), TDM is defined as "any automated analytical technique aimed at analyzing text and data in digital form to generate information which includes but is not limited to patterns, trends and correlations.[117]"

The UK government had launched a public consultation in 2022, and it had decided to introduce a new copyright and database right exception that allows TDM for any purpose, including commercial uses. An overall advantage of this solution according to the UK government is that of easing the obtaining of permissions, since in certain fields even if one would be willing to seek a license to use a work, this will not always possible due to the potentially high fees as well as the high number of rightsholders to deal with.[118] However, in 2024 the UK government decided not to move forward with such exception, leaving the matter unsolved.

US law is considered to be similarly favorable to TDM, though relying on the "fair use" doctrine rather than a specific TDM exception.[119] The act of reproducing copyrighted content to perform TDM has been upheld as fair use by multiple courts. Fair use is a legal concept that allows for the use of copyrighted material without permission under certain circumstances, and it allows copyright law to adapt to changing circumstances and new technologies. It helps to ensure a balanced copyright system. While the United States does not have a specific law that explicitly allows TDM, fair use has been used to accommodate the creation and growth of TDM as a new research tool.[120] Considering that the tool we analyzed, latent diffusion, does not even store copies, but temporarily learns from images, the defendants in Midjourney may try to rely on fair use exception in the United States. However, it should be underlined that in this paper we aim to provide a new perspective with creativity theories-based arguments only. This means that a broader policy discussion on exception (as well as a discussion on licensing system) should take into considerations other aspects, such as different exceptions, legal precedents, but also fairness to artists, distribution of IP incentives, social sustainability of the system, to name a few. A more focused discussion on

copyright exceptions is provided by Thongmeensuk, for example, that gives recommendations on striking a balance between innovation and IP protection.[121]

As we mentioned, while we believe that incentives should be in place for AI creativity, human creativity will still play a crucial role for evolution and innovation. In terms of art, the advent of AI generated works does not equate to the end of human artists. First, because as it happened in other fields, the niche of handmade products remains attractive. For example, fast fashion did not kill handmade garments, and 3D printing does not stop sculptors. Moreover, history teaches that artists have always needed to find audience, commissioners, networks. Also, as we shown, the main difference between AI and human creativity is the inner motivation, the flow, the absorption, the creating without having a scope or a purpose, and that should indeed determine the continuation of human creativity, because it does not depend on external conditions. Van Gogh would have probably painted Starry Night even today, when DeepDream represents a potential competitor. We would still have spent time naming the paragraphs with songs and rhymes because we like it, even if an AI could have done it better. Human creativity is not at risk, but copyright should continue to pursue its goal of stimulating both human and AI art.

Having said that, it would be naïve to underestimate the advent of such a technology in the artistic field. For this reason, we believe that research and innovation should also be directed to finding new ways to incentivise human artists in an increasingly AI-driven art environment. To this end, three main research avenues may be of interest for future research. First, to evaluate the option of introducing collective licensing schemes for using copyrighted works in AI training, in combination with transparency requirements for AI developers. Second, to investigate the creation of "sustainable art" certifications for businesses in relation to projects that engage with and invest in human artists, for example in advertising, marketing, graphics designs, and so on, which could act as incentives for big tech and AI companies, as well as users. Third, to study the impact of AI-generated art from an environmental perspective, to find optimal balance points between AI's and human's art to mitigate, among others, the CO2 emissions for companies of different sizes.

7 | CONCLUSIONS

"We can work it out"—Both AI's and human's art should be brought about

In this paper, we drew a comparison between AI's and human's creativity, using Van Gogh's and DeepDream's (an AI that uses latent diffusion) output Starry Night, to provide a new perspective that can help addressing two copyright concerns.

We first creativity theories from the field of psychology. Each theory presents a different perspective on what drives creativity and how it occurs, with some emphasizing individual motivations and skills, while others focus on the dynamic between knowledge, affect, and purpose. Some theories also suggest that successful creators must be able to recognize undervalued ideas and defy the crowd, while others propose that creativity is driven by an internal drive to experience flow and pleasure. We also reported neuroscience's knowledge, focusing on the brain's patterns identified with creativity, and acknowledging the limitations. We described DeepDream's functioning, and, specifically, how latent diffusion works, to compare it with what we know about human creativity. We found that AI and humans have similar creative patterns, and that our knowledge of creative brains apply, to an extent, to creative AIs. The main differences we found are the following: AI lacks inner motivation, the feeling of pleasure for an imminent breakthrough, and the flow that allows to create for the sake of it, without a purpose. Moreover, human brain is able to create even when damages are occurring at neurological level, whereas a damage in AI generative tools would equate to a damage in its creative performance.

On those premises, we evaluated whether this comparison could provide insights to inform copyright law related issues, given the relevance of terms like "creation," "create," and "creativity in both statutory and judicial language." The first copyright question asks whether AI-generated art is eligible for copyright protection. We argued that AI-generated art is the result of a creative process that is comparable to that of humans. Moreover, we

proved that the interaction of a human with the AI, via the act of sending a text prompt to the AI as an input, fills the gap between the AI and its output, since it functions as a "motivation" to create. Having analyzed the different originality standards to attract copyright protection, we argued that AI-generated art should be eligible in principle, on the basis of the underlying creative process. However, we acknowledged that copyright protection in the United States can only be granted to human-generated works, and that further policy interests are to be considered.

We then turned to the second copyright question: does AI infringe copyrighted works in its training? Such question became topical with the class action started in the United States against Midjourney, a company that uses latent diffusion AI. We proposed an analysis of how the human mind works when it creates, how it takes inspiration from outside, how it uses its memory, and we draw a parallel with how latent diffusion creates, without holding copies of training data (potentially copyrighted works), but rather learning and constructing from it. Based on that, one could support the idea that AI does not infringe copyright. However, we acknowledged that authors of works used in AI training might be entitled to a remuneration for other policy reasons within the scope of copyright. We stressed that an unclear legislative approach on such matter could stifle innovation in both AI's and human's creativity. We concluded by suggesting that future research in the field of human and AI creativity could look at collective licensing scheme for the use of copyrighted works in AI training, sustainable art certificates, and at environmental footprint, in light of finding optimal balance points between AI's and human's art, as well as mitigating the CO_2 emissions for companies of different sizes and incentivising both human and synthetic creativity.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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ENDNOTES

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[10] *See* Article 13 of the Charter of Fundamental Rights of the European Union and Article I, Section 8, Clause 8, of the United States Constitution.

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[28] V Golovko and others, 'The Nature Of Unsupervised Learning In Deep Neural Networks: A New Understanding And Novel Approach' (2016) 25 OMNN.

[29] Kaufman (n 11).

[30] Andersen v. Stability AI Ltd, Sec I par. 5, 8.

[31] Ibid. Sec I, par.4; Sec III, par. 20.

[32] Scott Barry Kaufman, 'The Neuroscience of Creativity: A Q&A with Anna Abraham' (Scientific American Blog Network) <https://blogs.scientificamerican.com/beautiful-minds/the-neuroscience-of-creativity-a-q-a-with-anna-abraham/> accessed 20 January 2023.

[33] Ibid.

[34] Studies use tasks such as the Alternative Uses Task and the Compound Remote Associates Task to measure creative potential by assessing ideational fluency, flexibility of thinking, and originality of ideas. The tasks used in these assessments often require a reframing or restructuring of existing mental representations which can lead to the subjective experience of a sudden breakthrough. An example of this is the compound remote associates task, where participants are presented with three words and are asked to find a word that forms a compound between the three words. Andreas Fink and Mathias Benedek, 'The Neuroscience of Creativity' (2019) 25 Neuroforum 231.

[35] Specifically, creative thinking has been associated with an increased functional connectivity between default and executive brain networks, potentially reflecting the interplay between generative and evaluative thinking processes (Beaty et al., 2016, 2018b; Fink & Benedek, 2019).

[36] "For example, envisioning possible improvements to products, requires memory processes to build novel representations of these products, sustained internally-oriented attention to guide active imagination, and vigorous executive control to realize effective and useful task solutions by evaluating/elaborating preliminary thinking results, and by inhibiting prepotent/conventional responses." (Fink & Benedek, 2019).

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[58] Eleonora Rosati, 'Why Originality in Copyright Is Not and Should Not Be a Meaningless Requirement' (2018) 13 JIPLP 597.

[59] Guadamuz (n 2).

[60] Rahmatian (n 54).

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[62] *See* <https://www.technollama.co.uk/do-androids-dream-of-electric-copyright-ownership-of-deep-dream-images>

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[67] *See* Section I, 1, 2.

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[69] Ibid 4.

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[71] Ibid 6.

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[85] It might be argue that the CJEU has applied the "domain test" in Football Association Premier League Ltd and Others (Case C-403/08) where sporting events were unable to attract copyright protection because "they cannot be regarded as intellectual creation classifiable as a work". However, in the same judgment, it seems that the Court's exclusion of sport events is due to their lack of originality.

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[87] Case C-145/10-Eva-Maria Painer v Standard VerlagsGmbH and Others [2013] par. 92.

[88] Case C-683/17- Cofemel—Sociedade de Vestuário SA v G-Star Raw CV [2019] par. 30.

[89] Opinion AG Trstenjak in Case C-145/10—Painer, para. 121.

[90] Hugenholtz (n 8).

[91] Painer (9) par. 89–90.

[92] European Commission (n 3).

[93] Ibid.

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[96] Ibid.

[97] Enrico Bonadio and others, 'Will Technology-Aided Creativity Force Us to Rethink Copyright's Fundamentals? Highlights from the Platform Economy and Artificial Intelligence' (2022) 53 IRIPCL 1174–1200.

[98] European Commission (3).

[99] Painer (9) par. 90.

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[101] Deep Learning machines can generate works that are almost ready to use with no needs of user's redaction.

[102] European Commission (3).

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[105] Rather than derivative works.

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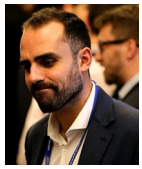

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