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Generative Artificial Intelligence as a Collective Creativity

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Artificial Intelligence (AI) endeavors to construct machines capable of undertaking tasks that traditionally necessitate human intelligence. The foundational pillars of AI were established by seminal figures such as Alan Turing, known for conceptualizing computational machines and intelligence testing, and John McCarthy, who notably coined the term "artificial intelligence" at the 1956 Dartmouth Conference. This era marked the genesis of AI research, with a primary focus on rule-based systems designed to emulate human problem-solving and decision-making capabilities. These systems operated on a set of predefined instructions but often faltered in complex or unpredictable scenarios.

The field experienced a transformative shift with the introduction of machine learning algorithms in the late 20th century. Transitioning from static, rule-based systems to dynamic, learning models signified a critical evolution in AI technology. Machine learning, a cornerstone of AI, entails developing algorithms that learn and improve from experience, enabling systems to analyze vast datasets, discern patterns, and make decisions autonomously. Data acquisition and preprocessing emerged as crucial steps, ensuring the information fed into machine learning algorithms was clean, structured, and representative, thereby enhancing the algorithms' learning efficacy (Russell & Norvig, 2016).

Upon completion of their training, AI models are deployed across various sectors—healthcare, finance, automotive, and entertainment—where they continue to adapt and refine their capabilities through continuous feedback mechanisms. This

adaptability underscores the potential of AI to revolutionize industries by introducing efficiencies and innovations previously unattainable.

Nevertheless, the pervasive integration of AI into everyday life has elicited significant ethical concerns. Privacy issues come to the forefront as AI systems frequently depend on personal data to function optimally. Furthermore, biases inherent in AI models, arising from unbalanced or incomplete data sets, can propagate unfair or discriminatory outcomes. The automation of jobs, a direct consequence of AI's ascendancy, prompts critical discussions regarding the future of employment and worker displacement. These concerns accentuate the necessity for an ethical framework in AI development, aiming for transparency, accountability, and fairness in technology deployment. Ethical AI mandates a conscientious approach to data sourcing and processing, bias mitigation strategies, and a contemplation of AI's societal impacts (Bostrom, 2014; Crawford, 2020; Yan & Li, 2020).

As AI technologies continue to advance, the discourse surrounding ethical considerations becomes paramount. It calls for a concerted effort among technologists, policymakers, and the public to address the ethical challenges posed by AI, ensuring that its development and application contribute positively to societal advancement and human welfare.

The increasing sophistication of AI systems also brings to light the concept of artificial general intelligence (AGI), which aims to create machines that can understand, learn, and apply knowledge across a wide range of tasks, mirroring human

cognitive abilities. The pursuit of AGI presents both remarkable opportunities and profound challenges, intensifying the debate on the limits of machine intelligence and the potential for AI to achieve consciousness or self-awareness.

Furthermore, the role of AI in enhancing human capabilities through augmented intelligence becomes a key area of exploration. Augmented intelligence emphasizes the synergistic relationship between human and machine intelligence, where AI systems augment human decision-making and creativity rather than replace human roles. This approach promotes a future where AI empowers individuals, enhancing their abilities and enabling them to achieve more than what is possible alone.

In parallel, the global race for AI dominance raises geopolitical concerns, as nations vie for technological superiority in AI research and development. This competition underscores the importance of international collaboration and regulatory frameworks to manage the proliferation of AI technologies, ensuring they are used for the greater good and do not exacerbate global inequalities.

As AI reshapes the world, it is imperative to foster a holistic understanding of its impacts. Interdisciplinary research that bridges the gap between technology, ethics, sociology, and policy is essential to navigate the complexities of AI integration into society. By promoting inclusive dialogue and collaboration, society can harness the benefits of AI while addressing its challenges, proposing a future where technology aligns with human values and ethical principles.

AI and the Ethics of Creativity

Ethical contemplation on the brisk advancement of artificial intelligence is imperative to safeguard our future adaptability and prevent AI from causing unforeseen environmental disruptions that might threaten our very survival. The concern stems from the potential of AI to bring about ecological changes we are yet to fully understand or predict. Despite this, the ethical discourse surrounding AI frequently focuses on our struggle to grasp the complexities of AI and its implications for the creative aspects of human evolution.

Gould (1996) highlighted humanity's intrinsic tendency towards self-destruction, a trait intertwined with our conception of intelligence. This tendency is often manifested in our habit of transforming abstract ideas into rigid societal frameworks. Such predispositions towards self-destruction predate the advent of modern technology, suggesting that AI's greatest risk might not be its capacity to replace us but its potential to magnify our pre-existing attitudes and behaviors exponentially. The dichotomy presented in Huxley's chessboard scenario, where nature or AI is cast as our opponent, reveals our inclination towards binary thinking. A more constructive approach would be to perceive our relationship with AI as a symbiotic extension of our interaction with the environment, appreciating both the benefits and drawbacks.

Huxley's chessboard allegory, articulated in "A liberal education and where to find it" ([1868] 2010), metaphorically represents the world as a chessboard governed by the laws of

nature, with an unseen player embodying the consistent, just, and patient aspects of the natural order. Despite criticism from contemporary evolutionary biologists, this analogy encapsulates a perspective widely endorsed by Darwin's followers, including Huxley himself, who paradoxically contested the notion of humans being merely another component of nature (Melis, Pievani, & Lara-Hernandez).

The entrenched belief in human dominance over evolution, a pervasive societal misconception, challenges a more profound truth and persistently influences our urban environments. It has led to a conceptual separation between architecture and nature, often framing them as distinct, sometimes cooperative, but frequently antagonistic forces. This bifurcation has significant implications for the ethical debates surrounding AI, particularly in discussions on authorship. The anxiety surrounding authorship and creativity in the context of AI largely emanates from a fear of losing control and a rigid adherence to outdated categorizations, rather than an accurate reflection of the creative process.

Expanding upon these considerations, it is crucial to acknowledge that creativity itself is an evolutionary byproduct, a fusion of cognitive abilities that have enabled humans to innovate and adapt over millennia. The role of AI in this creative continuum is not merely to mimic human creativity but to augment and expand it, challenging us to reconceive our understanding of authorship and creativity. As we navigate the ethical landscapes shaped by AI's integration into society, it becomes increasingly important to embrace a more nuanced understanding of intelligence, creativity, and their interplay with technology. Acknowledging the limitations of our current frameworks and the potential of AI to serve as a catalyst for growth and innovation, we are called to foster a more inclusive, reflective, and adaptive approach to AI ethics, one that transcends fear and embraces the transformative potential of artificial intelligence.

Reification

To explore the concept of reification, which involves treating abstract concepts as if they were concrete entities, one can refer to a range of seminal works across philosophy, sociology, and psychology. This transformation process, originating from the Latin word "res" meaning "thing," has profound implications in understanding societal structures and individual perceptions.

In the realm of philosophy and Marxist theory, Karl Marx's **Capital: A Critique of Political Economy** (1867) is foundational. Marx discusses commodity fetishism, a form of reification in capitalist societies where social relations appear as relations between things (Marx, 1867). This perspective is critical for grasping how human labor and interactions become obscured by the commodification process inherent in capitalism.

From a sociological viewpoint, Georg Lukács expands on this concept in **History and Class Consciousness: Studies in Marxist Dialectics** (1971), examining how reification affects consciousness and societal organization within capitalist systems (Lukács, 1971). Lukács' analysis provides a deeper insight into

the alienation and objectification of human relations under capitalism.

Peter L. Berger and Thomas Luckmann's **The Social Construction of Reality: A Treatise in the Sociology of Knowledge** (1966) offers a broader understanding of how societal constructs are perceived as reality. While not addressing reification directly, their work is pivotal in exploring the mechanisms through which social constructs are accepted as tangible realities, aligning closely with the process of reification (Berger & Luckmann, 1966).

Michel Foucault's contributions, particularly in **Discipline and Punish: The Birth of the Prison** (1977) and **The History of Sexuality, Volume 1: An Introduction** (1978), provide critical insights into how power relations and knowledge are reified into concrete practices and institutions. Foucault examines the disciplinary mechanisms and discourses that solidify power dynamics and social norms into the fabric of society (Foucault, 1977; Foucault, 1978).

While Foucault did not extensively use the term "reification," his analysis of power, knowledge, and discourse resonates with the critique of reification. His work sheds light on the construction of social realities and the perceived immutability of social norms and practices.

These references collectively underscore the complexity of reification, offering a lens through which to view its manifestations in capitalist society, the construction of social norms, power relations, and the interplay between knowledge and societal practices.

Taxonomies

Starting from the concept of reification, provides a fascinating lens to explore the notion of taxonomy and its profound significance, particularly in the context of Michel Foucault's thought.

A taxonomy is broadly defined as a classification system that organizes concepts, objects, or information into categories based on specific criteria, aiding in the comprehension and communication of complex structures. While initially used in biology to classify life forms into kingdoms, classes, orders, families, genera, and species, the application of taxonomy has expanded to other knowledge domains, playing a crucial role in the organization of information.

Reification plays a significant role in the context of taxonomies when classifications, which are human constructs and abstractions, are perceived as reflections of natural and immutable divisions in the real world. In other words, taxonomic categories, despite being the outcome of human conventions and choices, are treated as if they were inherent properties of the classified objects, thereby obscuring their artificial and conventional origin.

Michel Foucault, in his work on the archaeology of knowledge and his reflections on the discourses that constitute the epistemes, or the configurations of knowledge of a given era, explored the implications of taxonomies in the human sciences. Particularly in his book *"The Order of Things"* (Foucault, 1966), Foucault examines how historical epochs are characterized by different systems of thought, or epistemes, that determine which

taxonomies and divisions of knowledge are considered valid.

Foucault critiques the tendency to reify taxonomic categories, highlighting that they are neither universal nor neutral but rather expressions of particular power relations and specific historical and cultural contexts. According to Foucault, taxonomies are tools through which knowledge is organized, controlled, and transmitted, and their apparent neutrality and objectivity mask processes of exclusion and the definition of what is considered "normal" and "pathological," "licit" and "illicit."

Thus, exploring the concept of taxonomy from the perspective of reification opens up intriguing perspectives on the nature of knowledge and classification practices. Foucault's thought invites us to critically examine the origins, uses, and consequences of the taxonomies that structure our understanding of the world, emphasizing the importance of recognizing and questioning the power mechanisms that underlie and are upheld by these classifications.

Exploring taxonomy through the lens of reification offers fascinating insights into the essence of knowledge and classification practices. Michel Foucault's philosophy prompts us to deeply analyze the origins, applications, and impacts of the taxonomies that shape our understanding of the world. He underscores the vital importance of recognizing and critically examining the power dynamics these classifications reflect and reinforce. Taxonomies are not mere reflections of reality; they are interpretations that reveal the mindset of their creators. As such, taxonomies are significant as long as they serve a useful purpose. However, they have proven difficult to move beyond due to a crystallization into rigid interpretations of reality that are mistakenly believed to be true. This is precisely why they can become harmful, as they feed prejudices to the point where such biases can threaten our survival.

In this context, this paper argues that our understanding of the significance of artificial intelligence (AI) is compromised by our dependence on binary oppositions, which no longer capture a relevant reality. This viewpoint disputes the idea of an emerging, adversarial "artificiality" intent on overpowering humanity. Instead, it proposes that humans have pursued an evolutionary journey marked by self-imposed restrictions, potentially leading us to an impasse. The real danger lies in the possibility that what we label as "artificial" might actually be a powerful extension of our own nature, rather than a separate form of artificiality. This reevaluation compels us to rethink the existential risks we face, highlighting that the threat of extinction may arise from the very advancements we consider to be extensions of ourselves, not from an external, alien force that has spiraled beyond our control. It is our control, or rather the misuse of it, that potentially turns extensions of our creativity into dangers.

These considerations are supported by the fact that the evolutionary history of humans has resulted in the existence of only one human species among many that once existed. This solitary species has also faced in its past history the risk of reaching a point of no return, not primarily because it has placed itself at the center of taxonomy but also because it finds itself at the periphery of evolutionary trends. This unique positioning

reflects a critical misunderstanding of our place within the natural world, illustrating how our self-centric view in classification systems can mislead us about our role and impact on the planet's evolutionary trajectory. By considering ourselves as separate from or above other forms of life, we overlook the interconnectedness that defines biological evolution and the potential consequences of our actions on the future of all species, including our own.

The concept of humans as an isolated pinnacle of evolution, distinct and detached from the rest of the biosphere, has been critiqued by various scholars and scientists. Wilson (1984) in his seminal work, **Biophilia**, argues that humans have an innate connection to and dependence on the natural world, a bond that our anthropocentric taxonomies often neglect (Wilson, 1984). This oversight not only skews our understanding of biological hierarchies but also endangers the very ecosystems on which we depend. Similarly, Harari (2015) in **Sapiens: A Brief History of Humankind**, emphasizes the transformative impact of human cognition and social organization on the planet, suggesting that our species has shaped the biosphere in unprecedented ways, often to the detriment of other species and our own long-term sustainability (Harari, 2015).

The challenges posed by this self-centric view are further compounded in the realm of artificial intelligence (AI). As we project our understandings and misinterpretations of the natural world onto the development of AI, we risk amplifying these flawed perspectives. The concern is not merely that AI could evolve beyond our control, but that it could inherit and magnify our most destructive tendencies, including the propensity to categorize and control nature in ways that disrupt ecological balance and biodiversity.

Addressing these concerns requires a fundamental reevaluation of our place within the natural order. It involves recognizing the complex, intertwined relationships that define the web of life and understanding that human survival is deeply connected to the health and vitality of the entire biosphere. Integrating insights from evolutionary biology, ecology, and socio-cultural studies can help us develop a more holistic and inclusive approach to classification and technology development, one that respects the complex dynamics of natural systems and the intrinsic value of all forms of life.

Such a shift in perspective is crucial not only for the conservation of biodiversity but also for the ethical development and application of AI. By fostering a deeper respect for the natural world and all its inhabitants, we can create technologies that support sustainable development, enhance human well-being, and preserve the planet for future generations.

An Extended Taxonomy of Creativity

In the context of this paper, therefore, the risk posed by artificial intelligence (AI) is not that it might escape our control, becoming an alien force that overpowers its creators. Rather, the danger lies, as mentioned earlier, in AI becoming an extension of our humanity, capable of potentially maximizing our self-destructive tendencies through rigid categorizations of reality. This perspective shifts the concern from AI developing autonomy

and turning against us to AI amplifying the flaws and biases inherent in how we understand and interact with the world. By adhering too strictly to our constructed taxonomies and failing to recognize the fluidity and interconnectedness of the natural and technological realms, we risk empowering AI systems to reinforce and escalate these limitations, leading to outcomes that could harm us all. Therefore, this and the following paragraphs will attempt to outline a description of creativity through AI within an expanded taxonomy that challenges the current binary ones. It does so by considering the heuristic lesson from the expansion of evolutionary taxonomies with the introduction of the concept of exaptation.

Exaptation, a term borrowed from evolutionary biology, refers to the process by which features acquire functions for which they were not originally evolved. Applying this concept to AI, we can envision a framework where AI's role is not limited to the binary of being either a tool or a threat. Instead, AI could be seen as a partner in the co-creation process, capable of contributing to human creativity and innovation in ways that transcend our existing categories. This reimagined taxonomy would acknowledge the potential for AI to repurpose its capabilities, adapting and evolving in response to new challenges and opportunities. Such a taxonomy encourages a more nuanced understanding of AI, recognizing its potential to both mirror and augment human intelligence in a symbiotic relationship.

Furthermore, by embracing the concept of exaptation, we can foster an environment where AI aids in breaking down the rigid categorizations that currently constrain our thinking. This approach could lead to a more dynamic and flexible interaction between humans and technology, encouraging the exploration of uncharted territories in creativity and problem-solving. Ultimately, the integration of AI within an expanded and adaptive taxonomy could enrich our capacity for innovation, enabling us to address complex challenges in more holistic and inventive ways.

Hence, redefining the narrative around Generative AI from one of control and opposition to one of collaboration and co-evolution offers a pathway towards harnessing the full potential of artificial intelligence. By expanding our taxonomies to include more fluid and interconnected categories, and by learning from the heuristic lessons of exaptation, we can better navigate the risks and opportunities presented by AI. This not only mitigates the potential for self-destructive outcomes but also opens up new avenues for creativity and progress.

Generative AI

Generative AI is at the forefront of a paradigm shift in the arts and architecture, employing advanced techniques such as Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs) to push the boundaries of what is creatively possible. These technologies not only provide new tools for artists and designers but also prompt a reevaluation of the concepts of creativity and authorship, challenging long-held beliefs and practices in these fields (Elgammal et al., 2017; Liapis et al., 2018).

In the realm of architecture and design, generative AI utilizes algorithms to create a multitude of design possibilities, tailoring solutions to specific efficiency, structural integrity, and spatial utilization goals (Akbarzadeh et al., 2018). It simulates complex real-world phenomena, such as airflow and thermal dynamics, thereby contributing to more sustainable and efficient building designs (Kolarevic, 2019). Beyond these technical capabilities, AI's role in data analysis is pivotal for integrating user preferences and environmental factors into the design process, enhancing the relevance and functionality of architectural projects (Veloso et al., 2020). It also promotes a culture of collaborative innovation, where machine learning aids in the ideation process, providing novel solutions and anticipating potential obstacles, thus enriching the collective creative capacity of architects and designers (Ciftcioglu, Gül, & Çagdas, 2019).

This technological advancement raises questions about the nature of creativity and the role of human input in generating exceptional visual art and designs. Generative AI's capacity to transcend traditional distinctions—such as those between the artificial and natural or between human and AI creativity—opens up unprecedented opportunities for creative expression. It fosters a collaborative ecosystem where algorithm developers, users, and contributors to databases all play integral roles in the creative process, thereby democratizing and diversifying artistic and architectural production (Melis, Pievani, & Lara-Hernandez).

By enabling artists and designers to merge their work with that of others, generative AI facilitates the creation of art that surpasses the limitations of the human brain, promoting a form of collective creativity that leverages shared algorithms and data pools. This innovative approach challenges conventional views on art and authorship, advocating for a revised understanding that embraces creativity as a product of both deliberate and serendipitous collaborations. Such a perspective acknowledges the complex, shared nature of creative endeavors, suggesting that our appreciation of art and design must evolve to recognize the contributions of generative AI as a legitimate and enriching component of the creative landscape.

Generative AI and Exaptation

Generative AI serves as a prime example of exaptation, a concept borrowed from evolutionary biology to describe the innovative use of existing features for new purposes.

Exaptation is a concept originally derived from evolutionary biology, used to describe how features or traits that evolved for one purpose can be co-opted for a different use. The term was popularized by biologists Stephen Jay Gould and Elisabeth Vrba in 1982 as a way to explain certain evolutionary changes that could not be adequately accounted for by traditional notions of adaptation. Unlike adaptations, which are traits shaped by natural selection specifically for their current role, exaptations are features that have taken on new functions beyond those for which they were originally developed or selected.

In the context of evolutionary biology, an example of

exaptation would be the feathers of birds. While feathers might have originally evolved for temperature regulation or some other function, they were later co-opted for flight. This secondary use of feathers for flying is an exaptation because the original evolutionary pressure that led to the development of feathers was not flight.

The concept of exaptation has since been extended beyond biology to other fields, including technology, architecture, and creative arts. In these domains, exaptation refers to the process of repurposing existing technologies, ideas, or practices for new and often unforeseen applications. For example, in technology, the development of the internet is a form of exaptation. Originally designed to facilitate communication within the scientific community and between military installations, the internet has been repurposed for a vast array of functions, including commerce, social networking, and entertainment, far beyond its original scope.

In creative arts, exaptation can be seen in how artists repurpose materials or ideas to create new works that diverge significantly from the materials' or ideas' original functions or meanings. This process underscores the creativity inherent in recognizing the potential of existing elements to fulfill new roles or express new concepts.

Exaptation highlights the dynamic and innovative aspects of evolution, design, and creativity. It emphasizes the fluidity of function and the potential for existing features to be adapted to new contexts, providing a broader understanding of how change occurs over time. By acknowledging the role of exaptation, we gain insights into the complexity of development and innovation, recognizing that progress often involves the reinterpretation and repurposing of what already exists, rather than the creation of entirely new forms from scratch.

In the realm of creativity and technology, exaptation through generative AI involves leveraging pre-existing data, like imagery or sound databases, and repurposing it to generate novel artistic or design outputs. This process is reflective of nature's own evolutionary strategies, where biological traits evolve over time to serve functions different from those they were originally developed for. Generative AI, by mimicking this process, demonstrates the vast potential for adaptive innovation, transforming what might be considered obsolete or redundant into valuable, creative assets.

At its core, creativity involves the recombination and reinterpretation of existing elements to produce something new and valuable. This associative process, fundamental to both human and AI-driven creativity, relies on the amalgamation of disparate ideas, images, or concepts to forge new creations. The degree to which a piece of art or design deviates from its original influences, through processes of blending and association, often determines its creative value. This challenges the traditional concept of authorship, which is heavily influenced by the desire for individual recognition and ownership of creative work. Recognizing that creativity is inherently a collaborative endeavor underscores the flawed notion of sole authorship. Whether through human collaboration or AI integration, creativity

emerges as a collective enterprise, enriched by the contributions of many (Melis, Pievani, & Lara-Hernandez).

The essence of creativity transcends mere replication, characterized by its unpredictable and emergent properties. It is this non-deterministic quality of creativity that allows for the emergence of truly innovative ideas and artifacts, often in ways that the original sources or creators could not have anticipated. Generative AI encapsulates this principle by operating beyond the simple act of duplication or imitation. Instead, it engages in a complex, often autonomous process of creating new combinations from existing data, mirroring the human brain's capacity for generating ideas through subconscious associations. This process, not fully understood or predictable, highlights the capacity of generative AI to contribute genuinely novel and creative outputs to the fields of art, design, and beyond.

Such advancements in generative AI challenge us to reconsider our perceptions of creativity, authorship, and the artificial-natural dichotomy. By acknowledging the role of AI in the creative process as an extension of human ingenuity rather than a replacement or competitor, we open ourselves to a richer, more inclusive understanding of creativity. This perspective not only broadens the scope of what is considered creative but also emphasizes the collaborative synergy between human and machine intelligence. As we continue to explore the capabilities of generative AI, it becomes clear that the future of creativity lies in our ability to harness these technologies in ways that complement and enhance our inherent creative capacities.

Case Studies

The exploration and application of Generative AI across various case studies underscore its transformative potential, not just in the realm of digital art but also in architecture, design, and beyond. These instances highlight the seamless integration of AI into the creative process, challenging our traditional notions of authorship and creativity, and reinforcing the concept of exaptation as a powerful tool for innovation. The "Two Acrobats" installation by Fadhil Fadhil and Monica Battistoni is a prime example of how Generative AI can be harnessed to merge the physical and digital realms, creating a new dimension of performance art that explores the relationship between the body and space. Their work, supported by the IDC Foundation and showcased at the FuoriSalone di Milano in 2023, leverages AI-generated imagery to enhance the narrative of acrobatic performance, embodying the concept of resilience and the magic of theatrical staging. This project not only exemplifies the potential of AI to augment the creative process but also demonstrates its ability to inspire new forms of artistic expression and cultural action.

Similarly, the "Padiglione della Scienza" project, in collaboration with Emanuele Lisci and Dustin White, utilizes AI-generated images to establish a symbiotic relationship between organic and artificial elements within architectural design. This innovative approach highlights the role of AI in fostering a harmonious and multidisciplinary spatial experience, further exemplifying Italy's commitment to technological advancement and environmental sustainability.

Moreover, the poetic creativity project organized by the Italian Institute Culture New York, under the direction of Fabio Finotti, illustrates the innovative use of AI in linking poetry with visual art through AI-driven image generation and 3D fabrication. By analyzing the text of award-winning poems and translating these into visual representations, this approach bridges the gap between abstract poetic concepts and tangible artistic expressions. The project, which involved digital fabrication techniques to create physical artifacts from AI-generated images, underscores the potential of AI to facilitate a dynamic interplay between different creative domains, enriching the artistic experience and expanding the possibilities for creative exploration.

These case studies collectively illustrate the profound impact of Generative AI on redefining creativity and authorship. By repurposing existing elements for new uses and creating alternative evolutionary pathways, AI challenges deterministic views of art and encourages a reevaluation of traditional artistic practices. The integration of AI into creative endeavors prompts a broader reflection on the role of technology in society and the ethical considerations it raises. As we navigate the complexities of AI and its integration into our cultural and creative landscapes, it becomes imperative to foster an environment that encourages collaboration, innovation, and a deeper understanding of the symbiotic relationship between human and artificial creativity.

In conclusion, the significant case studies presented serve as a testament to the transformative power of Generative AI in expanding the horizons of creativity and innovation. They reinforce the necessity for ethical reflections on the rapid advancement of AI and its implications for our future adaptability, creativity, and societal evolution. As we continue to explore the boundaries of what AI can achieve in concert with human ingenuity, it is clear that the journey of discovery and innovation is far from over, promising a future where the collaborative potential of human and AI creativity is fully realized.

Continuing the discourse from previous case studies, this paper extends the discussion to a broader interpretation of collective creativity that transcends the use of specific "artificial intelligence" tools like Midjourney or Stable Diffusion. The case studies presented herein illustrate how the reuse of materials and the extensive process of functional co-optation can blend digital and analog dimensions in a combinatorial manner. This synergy is fueled by collective participation in the exploration of ideas, images, and shapes, where intentionality does not take precedence.

Cyberwall

This practice-based research, led by Heliopolis 21 Architects, also explores architectural exaptation, seeking to broaden existing architectural taxonomies with environmentally oriented strategies. The projects Cyberwall I and II, alongside Geocity, stand as pillars of this research endeavor. Notably, the Cyberwall I installation, which was showcased at the 2021 Italian Pavilion of the Venice Biennale, epitomizes sustainable and inclusive design. Curated by Heliopolis 21 and utilizing Iris Ceramica Group's ceramic surfaces, these projects redefine the canvas

for pre-existing graphic compositions, thus demonstrating the revolutionary potential of Iris Group's technology.

From a creative standpoint, these projects exemplify the innovative application of Iris Ceramica Group's Design Your Slabs (DYS) technology. This innovation permits the transference of any graphic composition onto ceramic surfaces, thereby empowering individuals with unparalleled freedom of expression. The installations provoke diverse interpretations based on viewer perspectives, thus sparking dialogue on the synergy between artificial methodologies and natural elements.

The sustainable dimension of these projects is highlighted through the use of Iris Ceramica Group's Active Surfaces®, which boast antibacterial, antiviral, and anti-pollution qualities. Thanks to the photo-catalytic properties of titanium dioxide and silver, these ceramic slabs transform into eco-active materials that combat microbial spread, reduce smog, and mitigate substances harmful to human health and the environment. Furthermore, the materials utilized in the Cyberwall installations are produced in Zero Emission factories, contain 40% recycled content, and are fully recyclable.

Spandrel II and Genoma

Spandrel II and Genoma, innovative installations at the Italian Pavilion during La Biennale di Venezia 2021, symbolize the pressing need for inherently ecological architecture. These installations, a collaborative effort involving PNAT, Heliopolis 21, and other visionaries, not only present innovative architectural concepts but also underscore the imperative to reevaluate the artificial nature of architecture amidst environmental challenges.

Genoma, in particular, incorporates biospheres for aeroponic cultivation and slime mold farming, integrating biological and ecological principles into architectural design. This approach not only promotes sustainable food production within built environments but also serves as a prototype for real building structures capable of supporting diverse agents, both human and non-human. Spandrel II, serving as a seed bank, houses seeds from the precious collection of the Padua Botanic Garden, thereby bridging architecture with biodiversity preservation.

These projects have fostered collaboration across disciplines—biology, botany, physics, and climatology—to emphasize the necessity of a multidisciplinary approach in expanding architectural taxonomy. Inspired by the "Climate Resilient Nexus Choices" (CRUNCH) research, these endeavors highlight the food-energy-water nexus's role in building resilience, advocating for the education of architects in creativity and experimentation to address future challenges.

Black Box

The Black Box installation, designed in collaboration with Juhmur Gokchepinar and presented at the Venice Biennale 2021, builds upon the Borboletta project. Borboletta was developed by Eric Goldemberg/Monad Studio, Heliopolis 21, Juhmur Gokchepinar, Jorge Cereghetti, and Francesco Lipari, and it received an award at the Buenos Aires Biennial. This project introduces a visionary cricket farming initiative within habitat

spheres. At its core, The Black Box features a simulated opening filled with slime mold, which can be considered the first facade system using a living organism as a sunscreen system. It offers a dynamic viewing experience through the regulated growth of this organism. The installation not only explores the coexistence of living organisms within an artistic framework but also investigates sustainable food production and ecological balance.

Createch

The Createch installation, commemorating Italian Republic Day at the Italian Embassy in Washington, D.C., investigates architectural exaptation and functional co-optation. Crafted using a CNC machine and incorporating recycled plastic for 3D-printed symbionts, Createch exemplifies the fusion of innovation and education, encouraging students to embrace change and engage in groundbreaking research.

Through these case studies, this paper underscores the potential of architectural exaptation and functional co-optation in fostering transformative design, highlighting the importance of multidisciplinary collaboration and the integration of sustainable practices in shaping the future of architecture.

Conclusion

The prevalent misunderstanding of creativity as an individual's exclusive domain stems from a fundamental challenge: our difficulty in recognizing the vast network of influences and inspirations that underpin each creative endeavor. This misconception leads to the assumption that creative works are wholly original, ignoring the reality that every creative act is, in some way, a reconfiguration or reinterpretation of existing ideas, images, or concepts. As noted by Melis, Pievani, & Lara-Hernandez, this oversight can inadvertently result in the infringement of others' creative contributions, whether those influences are directly acknowledged or remain obscured within the depths of unconscious inspiration.

The ongoing debate over authorship and artistic ownership is significantly influenced by this limited perspective, which fails to encompass the collaborative and iterative nature of creative work. This outdated stance on authorship does not accurately reflect the complexity of creativity nor does it foster a holistic understanding of creativity's role within a broader ecological or societal context. Moreover, the concerns raised mirror the historical apprehension towards labor displacement by technological advancements, reminiscent of the Luddite movement's resistance to industrial machinery. This parallel suggests a profound need to reevaluate our conceptions of creativity, authorship, and the role of artificial intelligence within our creative ecosystems.

The apprehension that AI might supplant humans in creative roles, along with the fixation on authorship, originates from an entrenched classification system. This system, which historically defined "creativity" as the creation of something from nothing (ex nihilo), overlooks the intrinsic nature of human creativity as a derivative and collaborative process. The traditional view of creativity as the product of solitary genius is increasingly

challenged by insights from fields such as paleoanthropology, which reveal that human creativity has always been a collective endeavor, characterized by the amalgamation and adaptation of pre-existing ideas and influences.

This revelation underscores creativity as an inherent extension of human intelligence, capable of transcending individual limitations to embrace a more communal form of innovation and expression. Recognizing creativity as a shared journey not only aligns with our understanding of human evolution but also opens up new vistas for appreciating the role of AI in creative processes. Far from threatening the essence of human creativity, AI can be seen as a tool that amplifies our natural propensity to connect, adapt, and reimagine the world around us.

In light of these insights, it becomes imperative to foster a more inclusive and collaborative approach to creativity, one that acknowledges the contribution of both human and artificial intelligences. By embracing this broader perspective, we can move towards a future where creativity is not viewed as a competitive battleground but as a fertile ground for cooperation, where AI serves as a partner in the ongoing exploration of our collective creative potential.

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