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Is AI the end of Human Creativity

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Abstract - Artificial intelligence (AI) is not the end of human creativity but rather a potent instrument to complement and expand it. In contrast to humans, AI is limited in its ability to think creatively, emotionally, and intuitively. Working together with AI, we may take use of its features to automate mundane chores and obtain insights, leaving us more time and energy for creative problem solving. Instead of restricting human creativity, combining it with AI technology might lead to ground-breaking advances in the arts, sciences, and other creative fields. Participants were 80 secondary school kids (mean age = 15) from various schools throughout India. The question, "How do we sustain life on Mars?" was posed to the class. Sixty students were responsible for completing this assignment during class time. Twenty pupils participated in this after-school activity. Study participants' perspectives on the question "Is AI the end of human creativity?" were analysed. A content analysis of the students' answers to many essential questions provided insight into this issue. The findings show that the students had a firm grasp on four key concepts related to artificial intelligence and creativity: social, emotional, technical, and learning.

Keyword - artificial intelligence, human creativity

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INTRODUCTION

The issue of whether AI will ever be able to equal human creativity is more pressing than ever in a world where technology breakthroughs are fast altering the ways in which people live, work, and think. Human creativity is fuelled by emotions and experiences that no computer can imitate, while AI is capable of analysing massive quantities of data and creating very complex outputs. The key issue, therefore, is whether or not artificial intelligence will eventually supplant human creativity.

Artificial intelligence and the creative process

We humans are special in that we can think outside the box and come up with ideas that can change the world. However, artificial intelligence (AI) is a kind of technology designed to carry out operations that would typically need human intellect, such as solving problems, comprehending language, and making decisions.

In order to evaluate the relative merits of AI and human creativity, it is necessary to have a firm grasp on both. Human creativity is impacted by elements like experience, emotions, and imagination, whereas AI depends on algorithms and data inputs to operate and make judgments.

There are limits to what AI can achieve, despite its enormous promise in fields like healthcare, finance, and manufacturing. When making decisions that call for empathy or intuition, for instance, AI falls short of the human standard because it lacks the emotional intelligence that accompanies it. Also, unlike humans, AI can't be inspired to create by its own feelings or form meaningful relationships.[1]

However, there may be constraints on human creativity in terms of time and materials. It's possible that people's potential is capped by things beyond their control, like their level of education and the state of the economy. But we humans can do things like think creatively and come up with novel solutions to problems by tapping into our intuitive knowledge and life experiences.

It's crucial to recognize the distinctions between AI and human creativity in order to draw fair comparisons between the two. When we work together and pool our resources, we can make even bigger strides in a number of different areas.

Advancements in AI

Industry workflows have been revolutionized by AI's progress, which has reduced the need for human interaction while simultaneously enhancing productivity. Using machine learning algorithms, we can now automatically analyze massive datasets for insights and patterns that may be put to use in predictive analytics. In addition, developments in natural language processing have allowed chatbots to provide automated responses to questions and complaints from customers.

Improvements in computer vision have also made it possible for computers to evaluate and interpret visual data with human-level accuracy. This has

been especially helpful in healthcare, as AI-driven diagnostic technologies have improved the precision with which illnesses like cancer can be detected.

AI has also aided in the creation of ground-breaking transportation and logistics innovations like self-driving vehicles and drones. In general, AI has made great gains toward enhancing automation and efficiency across a variety of sectors with very little human participation.[2]

The impact of AI on industries

Artificial intelligence (AI) has had an impact across many sectors, spawning novel uses and reshaping established procedures. New medications and disease-diagnosing prediction models have been created thanks to AI's use in the healthcare sector. In industries, AI-enabled robots are doing jobs that used to take people days. Large volumes of data might be analyzed by the banking and financial sector to reveal fraudulent actions and potential threats.

So, IoT and AI are what made it possible to build "smart" houses and communities. on addition, artificial intelligence has had a major impact on retail and e-commerce, particularly in the areas of customer service and supply chain management.

However, AI has also affected human employment and business models. other jobs can be done more quickly and precisely by machines than by humans, and other systems may be left to run automatically with no human input at all. This AI-caused loss of jobs is a major problem that has the potential to explode into a future unemployment crisis.

To guarantee the fairness and sustainability of AI use, it is also important to address issues of prejudice and ethical considerations, such as privacy and security problems.[3]

The overall effect of AI is still developing, and it will not reach its full potential unless it is closely monitored, ethical concerns are addressed, and human efforts are combined with those of AI.

The value of human creativity

Artificial intelligence (AI) will never be able to replace human ingenuity. Humans are the only species capable doing this, and it's what permits them to create novel solutions to difficult challenges. Innovation and technological advancement in many fields may be directly attributed to the inventiveness of the human mind. The ability to think unconventionally is a major advantage of being creative. It helps us come up with creative answers to challenges that may not be immediately obvious using more conventional approaches. Because we are creative beings, we are always finding new ways to adapt and improve. The creative potential of humans is unbounded, in contrast to AI's rigid adherence to predetermined rules. It is not limited in any way by preprogramed software or mathematical formulas. Because of this, we are able to evaluate every option, including ones that had previously been discounted. Creativity in the human realm extends beyond the simple production of novel ideas to the development of novel modes of self-expression. It's a cornerstone of who we are as individuals and as a society. It's what makes things like music, writing, and painting possible. Human ingenuity will become even more prized as we go toward a future where artificial intelligence and automation play larger roles. It's what separates humans from robots and fuels our ability to create a better tomorrow.[4]

The limitations of human creativity

The creative capacity of humans is astounding, but it also has its limits. The inherent prejudice of humans is a major shortcoming. We are prone to working within the confines of our own culture and producing art that is a direct reflection of our own personal histories and worldviews. This suggests that our imaginative capabilities may be constrained by our knowledge and lack the breadth that we want.

The pace at which people can think and make things is another barrier. To keep working effectively, we need to get enough sleep, relaxation, and breaks. This is normal and essential, yet it may hinder our creativity, intelligence, and efficiency. Artificial intelligence comes in helpful here since it may lessen the workload placed on humans.

Furthermore, the limitations of our physical capacities often stifle human creativity. For instance, our capacity to swiftly digest complicated information is limited by the quantity of data that can be stored in our short-term memory. Additionally, we have a finite range of perception for our senses of sight, hearing, touch, taste, and smell.

Finally, emotions may have a beneficial or detrimental impact on our creative production, depending on how they are processed. Emotions may either propel or stifle our inventiveness, depending on the context.[5]

Despite these constraints, people's imaginations are vital to our culture. The human mind is superior to any computer in its capacity to synthesize disparate ideas, thoughts, and experiences. Recognizing and accepting these constraints allows us to seek to expand our creative capacities and take use of tools like artificial intelligence to push ourselves farther.

Collaboration between AI and human creativity

A creative output is the result of a collaborative effort between an AI system and human cognitive processes. Humans give the foundational ideas, concepts, and experiences, while AI contributes

computing capacity for data processing, prediction, and aide in product development.

As a consequence of working together, productivity, precision, and originality may all increase. It has capabilities that surpass those of either human ingenuity or machine learning working alone. Although AI is unrivaled in its capacity to analyse large volumes of data and recognize patterns, human creativity may provide a fresh viewpoint and original ideas.

When combined, AI and human ingenuity may make strides toward solving problems that would challenge each one on its own. Art, architecture, advertising, and even music may all benefit from working together in this way.

An AI program might, for instance, sift through reams of customer feedback to determine what people really want, which would then inform the development of new items. Similarly, AI software may be used to assist architects in creatively designing structures that are environmentally friendly.

While there are certainly advantages to working together, there are also ethical considerations to keep in mind. Making AI and human innovation work for everyone requires answering questions of ownership, responsibility, and openness.

In a nutshell, combining AI with human ingenuity is a cutting-edge approach to the development of novel and practical goods that can adapt to an ever-shifting global market. It leverages the best of human and machine to speed up processes and boost output without increasing labor costs.

The future of AI and human creativity

It's conceivable that in the future, AI and human creativity will work together and interact more. AI has advanced to the point that it can accomplish things that were once considered to be beyond its capabilities, but it still has its limits, especially when it comes to creativity.

On the other side, human imagination is a potent force that has propelled advancement and invention throughout time. Although humans have their own capabilities limits, especially in terms of speed and processing capacity, AI still can't match human inventiveness.

Therefore, it is anticipated that in the future, AI will work more closely with human ingenuity. The use of artificial intelligence (AI) in creative fields including music composition, painting, and design are just a few instances of successful partnerships. In these contexts, AI is utilized to produce ideas and possibilities, which are then taken a step further by human creators.

As AI technology develops further, it is expected that more and more people will work together with machines to produce original works of art. Artificial intelligence (AI) may be a great resource for fostering creativity, but in the end, it is human ingenuity that propels development.[6]

In conclusion, both artificial intelligence and human imagination will play critical roles in shaping the future of many sectors. There is potential for rivalry and a lot of room for cooperation and synergy between the two. We may expect to find novel approaches to cooperation as we continue to probe the intersection of AI and human ingenuity.

LITERATURE REVIEW

Mayssa A.A. Elfar (2023) The goal of adopting any new technology is usually to better enable the creation of groundbreaking art. The development of intelligent computers that can match or surpass human performance in a variety of activities is the goal of artificial intelligence research and development. Artificial intelligence (AI) now plays a significant role in our everyday lives and affects a wide range of spheres. The way we interact with computers is about to undergo a sea change as this technology advances. Scientists are trying to broaden AI's applicability by equipping individuals with more potent methods of unleashing their imagination. Concurrently, they are trying to find methods to integrate these emerging technology with conventional art resources in order to expand their creative repertoire. Artificial intelligence may now be used by artists in ways that were previously unimaginable, thanks to the availability of these technologies. AI has muddied the line between finished product and medium. In this article, we explore how AI may broaden the creative process by removing some of the barriers posed by the human brain and sparking the imaginations of future artists and designers. We also look into the future of this innovative technology and discuss how artists and designers are using AI into their work. One of the most important things you should take away from this article is the idea that AI may be utilized to broaden the creative process by allowing individuals to break free of their mental constraints and sparking ideas for new creative designers. Generating new compositions from existing photos, analysing artwork, and increasing accuracy and efficiency may all be accomplished with the help of AI. Artificial intelligence (AI) may also be utilized to develop imaginative visuals and original designs via the use of algorithms to aid artists in their work. The idea of fusing AI with the design process is intriguing, current, and calls for debate.[7]

Zhuohao Wu, Danwen Ji (2021) Several industries are opening up to the possibilities presented by artificial intelligence (AI). Many people have voiced their concerns about the rise of AI and the difficulties it poses, such as the loss of human jobs and moral dilemmas. However, discussing how to utilize AI creatively and how AI may increase human creativity

in a systematic manner is far from sufficient. We found that concentrating on the cooperation with AI would be far more beneficial than focusing on fighting against AI after reviewing over 1,600 application examples in over 45 different fields and relevant research papers. The term "AI Creativity" describes the synergistic benefits that result when humans and AI work together. Complementing human intellect, AI synthesizes the collective knowledge of all of humanity's accomplishments and facilitates global teamwork in real time. Artificial intelligence gives us agency across the board in the creative process, therefore democratizing and expanding participation in the arts. To explain creativity in the age of AI, we suggested a Human-AI Co-Creation Model that incorporates the novel opportunities afforded by AI at each stage of the process. Further, every "meaning-making" activity may be improved by AI and delivered more quickly using this approach. The emphasis on cooperation is echoed by the quest for human-machine collaboration in the creative process. The analysis of real-world examples demonstrates the far-reaching effects of AI Creativity, which opens up new horizons for human society and the individual, while also posing fresh difficulties and opportunities in the realms of science, engineering, and education.[8]

Fernand Gobet1 * and Giovanni sala (2019) There have been significant advancements in artificial intelligence (AI) in recent years. These advancements have shown the sophisticated inventiveness of computers while highlighting the severe limits of human logic. Positive benefits for creativity research in psychology are also substantial. The basic tasks formerly utilized in the study of creativity in psychology have been superseded by the possibility of designing totally new kinds of studies. Furthermore, new theories of creativity are on the horizon in light of present and future AI algorithms for creating innovative data structures and programs. As a result, the field of psychology's study of human creativity has new doors opened to it thanks to AI.[9]

FLORENT VINCHON, TODD LUBART (2023) New possibilities and difficulties await the creative industry as a result of the development of artificial intelligence (AI). Several possibilities of human-machine cooperation on creative work are discussed, and "fundamental laws of generative AI" are proposed to encourage the responsible and ethical use of AI in the creative sector. Possible futures that include human-machine cooperation are explored via the lens of four scenarios: "Co-Cre-AI-tion," "Organic," "Plagiarism 3.0," and "Shut down." In addition, we have added a manifesto written by AI that emphasizes similarly crucial concepts, such as accessibility, ethics, and cultural awareness. The suggested basic laws have as their overarching goal the suppression of malicious AI content production and direct human competition. The need of establishing regulations and tagging AIs with descriptive names is also emphasized. Collaborating in a way that benefits all parties and which respects ethical concerns and human values throughout the creative process is the future of creativity and AI.[10]

METHODOLOGY

Participants were 80 secondary school kids (mean age = 15) from various schools throughout India. The question, "How do we sustain life on Mars?" was posed to the class. Sixty students were responsible for completing this assignment during class time. Twenty pupils participated in this after-school activity. Whether a student took part in the program as part of their normal science lesson or as an extracurricular activity, the material covered remained the same. Both were produced by the same dedicated team.

Method

Grounded theory (GT) is a method that is both organized and flexible, making it useful in situations where there is little background information. Grounded theory is a method for explaining phenomena by paying close attention to people's genuine experiences and feelings. One of GT's main aims is to generate theories based on empirical evidence. This method was preferred since there is a shortage of research on how pupils see AI and creativity. The students looked into several related sub-problems, one of which being the creation of a Mars Rover. Students in science classes that took part worked in teams of four to five and dedicated a whole week's worth of class time (four 50-minute classes) to learning about artificial intelligence and building their Rover. Over the following seven weeks, students spent an average of ten minutes every class (forty minutes overall) engaging with the AI. The extracurricular version of this program had students meeting in person for six hours on a single day, divided into groups of four or five. Zoom was used for all the other classes, and there was no AI involved at all. Fischer Technik kits were employed in the students' Mars Rover builds, and a computer-aided analysis of visual data tool was used to assess their work. The vision analytics tool is powered by technology created by experts, but its use in schools is meant to inspire innovation at the mini-c or little-c level among students. The students use the technology to get personalized feedback throughout the building process, which explains why this is the case. This information might be used by the students to gauge the effectiveness of the AI in helping them create the Rover. The visual analytics system could then scan the kids' Rover and transport it to a 3D virtual environment, where it could be tested on Mars. The results of gravity and the Earth's surface were shown. In this open-ended task, students were urged to apply their own discretion and imagination. Part of their training in the creative method was a discussion of "What is creativity and what is it not?

RESULT AND DISCUSSION

Study participants' perspectives on the question "Is AI the end of human creativity?" were analysed. A content analysis of the students' answers to many essential questions provided insight into this issue.

The findings show that the students had a firm grasp on four key concepts related to artificial intelligence and creativity: social, emotional, technical, and learning.

Social Factors

The discussions suggested that many Indian secondary school students worry that AI may make them less sociable. Negative opinions and assumptions about AI were most often listed as obstacles and facilitators of AI. Previous studies have shown that AI will push humans into jobs that emphasize interpersonal communication and cooperation. Students, however, worried that AI might have a detrimental effect on their interpersonal abilities. Statements like "AI has the potential to make individuals lack "socially" Some research suggests that students may be negatively impacted by the rise of AI, which has been cited in statements like "Well, if we're talking about robots and such for computers and phones and digital media social media, that kind of stuff... it's taking away from people's social lives, and they're just more concerned about having a digital platform to present themselves on," and "AI can make social intelligence weaken a little bit, which can affect them." As one student put it, "making AI a mainstream thing so everyone can speak to everyone on it, so we can ask whole communities and get out with a lot of people," is crucial if we want to alter the way we talk about artificial intelligence. These mixed feelings about AI have the potential to discourage students from using it in the classroom. The impression of the application of AI for societal benefit influences elementary school kids' interest in learning AI, as shown by Chai et al. (2021). In addition, Chai et al. (2020) note that students' perceptions of the social good potential of AI education are the strongest predictors of their own behavioral intentions to pursue AI education. The students also concluded that AI would never be successful in occupations that demand human creativity and deliberation to solve problems. When asked whether AI can equal human talents, one focus group said that a member of the group had a pilot father. Humans, they said, should never be replaced by AI in the cockpit because of the difficulty of tasks like operating an aircraft. Interestingly, everyone in the room agreed, and they all appeared oblivious to the complexity of modern aviation. This demonstrates a lack of awareness on the part of students about the potential benefits of AI in helping humanity. The students in this study group misunderstood the function of artificial intelligence (AI) as a teammate, supposing it to be exclusively human in nature. Students need to be taught more about the importance of human-AI collaboration and the ways in which AI may help people even in apparently social or sophisticated settings. Although people may worry that AI would hurt their social abilities, this fear really gives an opportunity to show how AI may improve such skills and strengthen community bonds.

Affective Factors

Many different emotional reactions to AI were described by the students. Those pupils who showed linguistic familiarity with AI also reported increased confidence while working with AI tools. However, students who said they did not know what AI was also reported feeling less confident when asked to define AI and when asked if they felt comfortable incorporating AI into their lectures. One kid said he felt secure using his computer since he had "all the safety programmes on it," indicating that he trusted his computer's artificial intelligence algorithms. 'I think computers and programming and sending a computerinstructions,' said another student. 'But that, of course, depends on the sort of AI. They said they wouldn't feel as safe with 'robots and machines' if given the chance to explain why. More confidence in AI is a direct result of the system's openness. This is consistent with other studies finding that advocating for openness and avoiding 'black box' recommendations may increase the use of artificial intelligence. We call this kind of AI "explainable."

Technological Factors

It's interesting to note that most students' conceptions of AI centered on technical considerations. There was a lot of overlap between the many technological, automated, coding/programming, futuristic, not human, and robotics categories. Because most of the students' experiences with artificial intelligence have been limited to the digital realm, this is the common conception among students. All of the students had a hard time getting beyond the assumption that artificial intelligence (AI) is nothing more than robots and computers, which may be regarded as a sign that their understanding of AI is rather restricted. They thought that AI was more of a 'futuristic' phenomena than anything that would have an immediate influence on their life. All the students said that robots were a part of AI in their definition. Both Chiu et al. (2021) and Chiu and Chai (2020) recommend teaching students about AI by focusing on practical examples they can relate to. When asked whether AI would ever be able to equal human creativity, students stated that it is important to continue encouraging creativity because, despite AI's technological superiority, it will always be a distinctly human attribute. "Basically, most things in artificial intelligence are made by humans, so, unless we actually create a robot which can be a human, it probably won't be able to match the creativity of humans," said one student. Students who were optimistic about AI's potential to one day equal human creativity often made statements along the lines of "maybe over time, when technology gets a lot more advanced, I think that it would eventually be possible to be as creative as humans." Therefore, they concluded that AI lacked the creative capacity of humans at the time, but that this may change in the future. In response to the

question "do you think AI will ever be as creative as humans?" A student made a fascinating observation. 'Yes, kind of,' she admitted. That is a fascinating inquiry. Imagination is sparked, in my opinion. No idea whether AI (has the capacity for) creativity. However, I believe that robots may serve as creative catalysts, even if robots themselves cannot be creative. This is because, for a robot to be creative, someone must have created it and endowed it with creativity. AI is seen by some people as a tool to help with or even "spark" creative thinking. These responses argue that artificial intelligence should be utilized to foster innovation. In their latest study, Markauskaite et al. (2022) show how artificial intelligence may be utilized to foster creativity in people of all ages. The author's polylogue offers specific recommendations on where and how artificial intelligence might be utilized to foster creativity, with a focus on the needs of students, in accordance with the 4C theory of creativity.

Learning Factors

Learning factors is the most common and often-mentioned category. The majority of students surveyed had a favorable impression of AI and claimed that it helped them get easier access to relevant information, fostered international relationships, encouraged creative thinking, and facilitated their education. The students also said that they were better able to manage their time and had more original ideas as a result of being creative. Students noted, however, that the constraints of their existing classroom settings sometimes inhibit their potential to be creative. Student comments like "sometimes you can't (be creative); sometimes you do have a set structure of things that you have to follow, and you can't always be creative, which can sometimes be a bit sad because you want to do something interesting but sometimes you know you have to follow a set structure for an assignment or s" indicate a lack of time and assignments that are not designed to allow for the development of creativity. The students offered recommendations for how their classroom settings may better foster original thought. Students believed AI might aid in the development of their creativity by fostering autonomous thought and providing possibilities for creative expression. 'Also, if you're trying to make a robot move down a path or something, sometimes it's going to bump into things and it's going to, you know, go a bit wonky, so you've got to think out of the box and you, hang on a second, what's going wrong here and then backtrack kind of thing, thinking in a different mindset, I guess, to how you usually think,' said another student. When challenged to go deeper in their thinking, pupils believe AI can help them. Since students have shown interest in exploring their creative potential and interacting with artificial intelligence, it has been proposed that schools provide pupils with such chances.

Practical and Theoretical Contribution (From 4C to 4AI)

A variety of views on AI were held by the students, with those more familiar with the technology holding the most favorable views. According to studies on confidence in AI, this is accurate. Similarly, those who know how to define creativity and place a high value on it tend to believe that artificial intelligence will never be able to compete with human ingenuity. It is interesting to note that when students were asked to describe AI, they tended to think about AI in extremely broad terms, either as generic AI or Artificial Super intelligence. The pupils' failure to recognize that they had participated in a rigorous curriculum built on focused AI was startling. Taking a 4C perspective to these findings, we argue that students do not place importance on 'everyday-AI' (a name we coined by combining the terms "mini-c" and "little-c"). One suggestion for making AI more widely used in schools is to help students clear up any misunderstandings they may have about the technology. We propose a "4AI model of Artificial Intelligence" that builds on the 4C theory of creativity. Mini-AI, little-AI, Big-AI, and legendary-AI are proposed as variations on the 4C framework. Though the AI tool was designed to accommodate mini-c and little-c, the students' descriptions suggested that they placed less value on these smaller forms of AI. Based on parallels with the 4C theory of creativity, we propose a '4AI Model of Artificial Intelligence in Education' that considers four distinct facets of AI. Educators should emphasize this since students are less likely to encounter Big- or legendary-AI than they are to encounter mini-c and little-c, and because these technologies are more accessible to pupils. One approach would be to dispel common AI myths and misunderstandings while simultaneously encouraging students to see and value daily applications of AI, no matter how little. Like creativity, which may be taught with, for, and about, the same is proposed for artificial intelligence: teaching for AI, with AI, and about. Micro- and low-level AI may be investigated in these three settings. It is hoped that via participation in this program, students' knowledge of AI would become more grounded in reality, mitigating some of the concerns they have expressed.

CONCLUSION

Students' responses to these concerns provide insight on how they see the intersection of AI and creativity across four dimensions: social, emotional, technical, and educational. While students generally agreed that AI will never be able to fully replace human creativity, they did agree that technology might help them nurture their own unique brand of originality. The results suggest that students missed the program's key focus mini-AI and little-AI experiences and that a 4AI model of Artificial Intelligence may assist instructors better support them. Research in the future might concentrate on finding ways to utilize AI to help with the issues

students have brought up and to help them be more creative.

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