Artificial Intelligence and Ethical Dilemma: Chat-GPT Uses' In Scientific Research

الذكاء الاصطناعي والمعضلة الأخلاقية: استخدام الذكاء الإصطناعي Chat-GPT في البحث العلمي

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Abstract:

This study examines the ethical implications and biases of using Chat-GPT in scientific research and proposes a framework for fairness. The main question is whether a standardized framework can address bias in Chat-GPT. Objectives include exploring ethical dilemmas and proposing a framework for unbiased use. The research covers bias in training data, the applicability of ethical frameworks, standardization challenges, and the impact of bias versus benefits of Chat-GPT.

Results show that training data and algorithms introduce biases, existing ethical frameworks have limitations, and standardization is complex. Despite biases, Chat-GPT offers benefits, necessitating ethical guidelines. Addressing bias requires frameworks, critical thinking, and continuous ethical considerations.

Key Words: Ethical Dilemma; Usage; Bias; Chat-GPT; Scientific Research.

الملخص:

تدرس هذه الدراسة الآثار الأخلاقية والتحيزات المحتملة لاستخدام نموذج Chat-GPT في البحث العلمي، كما تقترح إطار عمل لتعزيز الاستخدام العقلاني والعلمي . تمحور السؤال الرئيسي حول وجود إطار عمل موحد ومعياري يمكنه معالجة التحيز في نموذج Chat-GPT. تشمل أهداف البحث استكشاف المعضلات الأخلاقية واقتراح إطار عمل للاستخدام الخالي من التحيّز. يغطي البحث تحيز بيانات التدريب، وإمكانية تطبيق الأطر الأخلاقية، وتحديات التوحيد، وتأثير التحيّز مقابل فوائد استخدام نموذج Chat-GPT.

تُظهر النتائج أن بيانات التدريب والخوارزميات تتسبب في تحيزات، وأن الأطر الأخلاقية الحالية لها قيود، وأن التوحيد عملية معقدة. وعلى الرغم من وجود تحيزات، إلا أن نموذج Chat-GPT يوفر مزايا، مما يستدعي وجود إرشادات أخلاقية. يتطلب معالجة التحيّز والاعتماد على الأطر الأخلاقية والتفكير النقدي والاعتبارات الأخلاقية المستمرة.

الكلمات المفتاحية: المعضلة الأخلاقية ; الاستخدام ; التحيّز ; Chat-GPT ; البحث العلمي.

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INTRODUCTION:

The world is witnessing a technological revolution that transcends the boundaries of time and space, making the use of modern technological tools in various domains of life an inevitable necessity. These tools offer significant conveniences in the exchange of knowledge and information. The World Wide Web and its extensions have facilitated the creation of numerous platforms, vast data repositories, and social media networks, eventually reaching a point where human behavior is simulated, approaching the ability to emulate human faculties such as intellectual, cultural, and scientific creativity.

This technological advancement has materialized in what is now known as artificial intelligence, which has rapidly evolved to deliver technical and scientific services. One of the most prominent tools in this realm is Chat-GPT technology, which has significantly simplified the tasks of researchers by enabling them to perform activities that were once the exclusive domain of the human brain, such as scientific writing, logical analysis, and the formulation of research results through the relational analysis of variable

However, selecting a scientific research topic and addressing it according to a sound methodology requires adherence to established regulations and ethical standards, which researchers are obliged to follow. When a human researcher analyzes a scientific research topic, their interpretation is based on an understanding of the relationships between the researches variables, enabling them to objectively explain the data collected from their field study.

In contrast, relying on analysis through artificial intelligence is based on inputs obtained from open research sources, raising concerns about the reliability and objectivity of the results derived from AI. Additionally, the use of AI may create ethical dilemmas that warrant further interpretation and critique.

The interest in artificial intelligence has become one of the concepts that concern many scientists in various scientific fields, and countries have begun to adopt it with caution, taking into account the importance of the human element in performing various tasks, and in an effort not to apply it completely in different areas of life, from the interpretation of huge databases and economic analysis, as the scientific field is the fuel tank for the rest of the sectors, because science is the first source and the basis in improving the living conditions of citizens, and the ability to create new sources of creativity in all that is technological and economic, but given all these positives, the aspect of the ability to commit objectively And not to fall into bias, this element is one of the most factors that

the researcher seeks to stay away from, in order for his research results to become more reliable.

This study aims to shed light on the concept of artificial intelligence and its most important uses in the field of scientific research, as well as clarify the concept of the ethical dilemma associated with the completion of scientific studies, and clarify what are the basic pillars in the formulation of information without falling into an ethical dilemma that causes prejudice to the credibility of scientific research. This study aims to expose the use of Chat-GPT in the field of scientific research and the changes occurring in the methods of analysis and criticism in scientific research, and highlight the most important ethical dilemmas that a researcher can fall into due to the use of Chat-GPT.

1.Artificial intelligence and the ethical dilemma:

1.1 Definition of the Artificial intelligence[1]:

According to the father of Artificial Intelligence John McCarthy, AI can be defined as "the discipline and application of creating intelligent machines, particularly through the development of intelligent computer programs. It is also defined as the way of making a computer, a computer-controlled robot, or software think intelligently, in the similar manner the intelligent humans think, also AI is accomplished by studying how human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

1.2 Ethical Theories[2]:

The major ethical theories relevant to AI ethics, primarily consequentialism and deontology. Consequentialism evaluates actions based on outcomes, while deontology focuses on the duty and motivation behind actions. Other applicable theories include virtue ethics and feminist ethics of care.

The author emphasizes the connection between ethics and the human condition, viewing ethics as integral to existence and interaction. The concept of human flourishing is introduced as crucial. The author intends to draw from various ethical sources, particularly virtue ethics, to shape their position on AI ethics, rather than relying heavily on deontology and utilitarianism.

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[1] *Tutorials Point Edition, (2015, January). Consulté Le October 23, 2023, P.01.*

[2] *Carsten Stahl, **Artificial Intelligence**. Cham: Springer, 2021, PP.21-22.*

1.3 Morality and ethics, and how that relates to AI:[1]

At its core, ethics defines the moral principles guiding individual conduct and action execution. Respect for all is a foundational example. Philosophical discourse on ethics spans centuries, with renowned principles like Kant's categorical imperative, which emphasizes acting as you'd wish others to act universally. AI ethics focuses on developer, manufacturer, and operator behavior to minimize potential problems arising from flawed design, misuse, or inappropriate application of AI in society. This includes immediate concerns like data privacy and bias, along with near- and mid-term anxieties about AI's impact on jobs, and long-term considerations about AI surpassing human capabilities.

1.4 Bias in Artificial Intelligence:

Artificial Intelligence, as a human creation, is susceptible to bias originating from the data used in training AI systems or the values inherent in developers and users. Systematic biases often arise when machine learning models are trained on data that predominantly reflects specific demographic groups or societal prejudices.

Numerous incidents have highlighted how AI inadvertently perpetuates social biases, reinforcing or replicating them in its outputs. It's crucial to recognize that AI lacks ethical judgment and cannot discern between right and wrong or truth and falsehood. It gathers information from databases and texts on the internet, potentially incorporating cognitive biases present in that data. Therefore, it is imperative to critically analyze AI-generated results and cross-reference them with other sources of information[2].

1.5 Foundations and Criteria in AI Ethics: Exploring Essential Principles for Reliability

What are the ethical foundations of AI?[3]

The most extensive collection of AI ethics guidelines published to date outlines the fundamental ethical principles, encompassing transparency, justice,

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[1] *Bird, E., Fox-Skellyand others,* ***The Ethics of Artificial Intelligence: Issues and Initiatives****, Brussels: Mihalis Kritikos, Scientific Foresight Unit, 2020, PP.02-03.*

[2] *Sabzalieva, E., & Valentini, A****. Chat-GPT and Artificial Intelligence in Higher Education****, Caracas: UNESCO Iesalc, Consulté Le October 27, 2023, P.10.*

[3] *Carsten Stahl, Op.cit., PP.28-30.*

fairness, non-harm, responsibility, privacy, beneficence, autonomy, trust, sustainability, dignity, and solidarity.

What are the essential criteria for establishing reliable AI?

The EU's High-Level Expert Group on Artificial Intelligence proposes a framework for dependable AI, emphasizing lawful, ethical, and robust AI. It is underpinned by four ethical principles: safeguarding human autonomy, preventing harm, ensuring fairness, and promoting explicability.

These principles inform seven critical criteria for dependable AI, encompassing human oversight, technical robustness and safety, effective data governance and privacy measures, transparency, diversity, non-discrimination and fairness, and considerations for societal and environmental well-being, alongside mechanisms for accountability.

What does the principle-based method in AI ethics entail?

The principle-based approach to AI ethics involves steering away from firm commitments to often disputed ethical theories, focusing instead on generally agreed-upon ethical principles such as respect for human autonomy, prevention of harm, fairness, and explicability. This method provides an opportunity for achieving consensus[1].

1.6 Ethical issues with artificial intelligence:

Ethical concerns in AI, specifically regarding transparency, fairness, and accountability, have gained significant attention from researchers. Instances of bias in AI algorithms highlight the urgent need for ethical AI development. Advocates stress that responsible AI models must prioritize fairness, transparency, and privacy.

The FAST principles—Fairness, Accountability, Sustainability, and Transparency, emphasize these core components. They underscore the importance of interpretability in AI models while considering constraints like data privacy and fairness. To achieve responsible AI, developers and organizations must collectively integrate these principles[2].

[1] *Carsten Stahl, Op.Cit, PP.28-30.*

[2] *Marshan, A,* ***Artificial Intelligence****:* ***Ann Robot Automation****, Volume 05, Issue 01, 2021, August 3, PP.35-36*

2. Chat-GPT: Shaping Education, Research, and Ethical Frontiers:

2.1 Chat-GPT/ A Brief Overview[1]:

Chat-GPT, built on the Transformer model, is a neural network designed for generating text based on given inputs. It undergoes extensive pre-training using unsupervised learning on diverse text data to grasp language structures. With its architecture utilizing self-attention and neural networks, it effectively captures word relationships crucial for natural language processing tasks.

During pre-training, the model learns to predict subsequent words, improving its comprehension of language patterns. Following pre-training, it can be fine-tuned for specific tasks like translation or classification. A notable feature of Chat-GPT is its ability to generate coherent responses in open-ended conversations typical of chatbots. This capability hinges on the model predicting each word based on preceding ones, ensuring fluency and coherence throughout the text it generates.

2.2 Artificial Intelligence and the Field of Education[2]:

The impact of Charged, a generative artificial intelligence, on science education. It delves into the pivotal role AI plays in the digital transformation of our society, highlighting its capacity to automate tasks, handle extensive data, and offer predictive insights.

This transformative technology is expected to revolutionize numerous facets of our everyday experiences. Additionally, the PDF scrutinizes the utilization of Chat-GPT in responding to science education queries, how educators can integrate Chat-GPT into their teaching methods, and its application as a research instrument.

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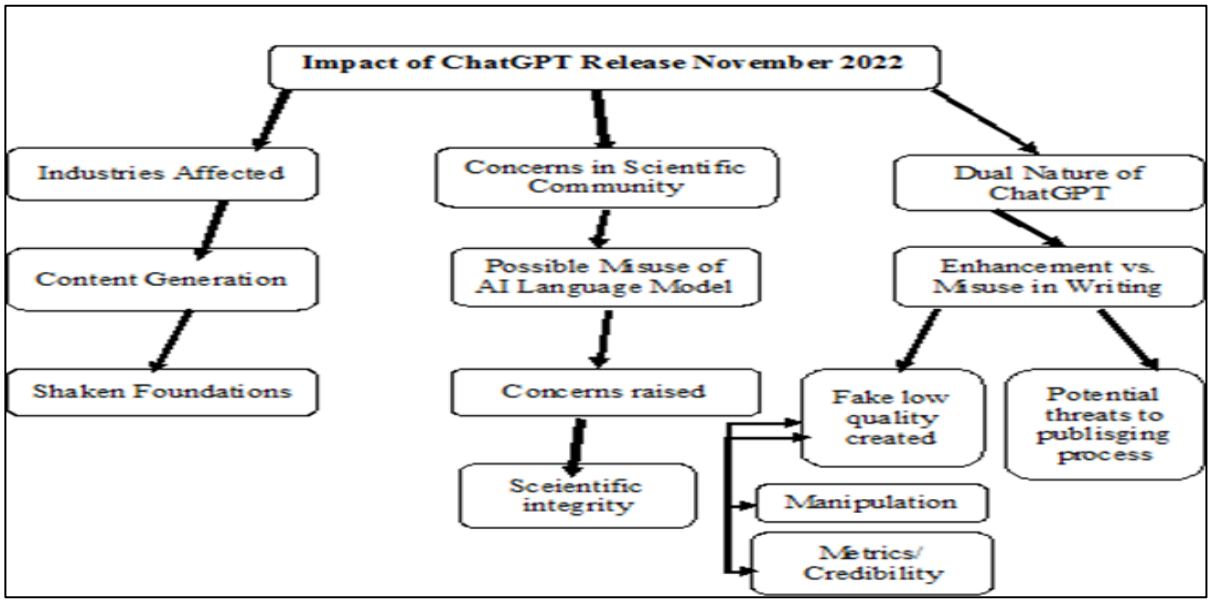
[1] *Hossein, H., & Emmanuel Sirmal, S,* ***the Role of Chat-GPT in Data Science. Big Data And Cognitive Computing****, Volume 7, Issue 02, 2023, March 28, P.03.*

[2] *Cooper, G.* ***Examining Science Education In Chat-GPT****, Journal of Science Education and Technology, 2023, March 22, P.444.*

Figure (1): Chat-GPT's Influence on Scientific Integrity



Source: Prepared by the Researcher [1]

This diagram illustrates the central impact of Chat-GPT's release, leading to its effects on industries and the concerns raised within the scientific community. It highlights the dual nature of Chat-GPT, its potential to enhance writing and content generation, and the risks associated with the creation of fake or low-quality papers, leading to potential threats in the publishing process.

2.3 UNESCO's Guidance for Policymakers on AI and Education includes[2]:

➢ *System-Wide Vision and Priorities: Setting a comprehensive vision and strategic priorities.*

➢ *Principles for AI in Education Policies: Establishing overarching principles for AI integration in education policies.*

➢ *Interdisciplinary Planning and Governance: Emphasizing cross-disciplinary planning and inter-sectoral governance.*

➢ *Equitable, Inclusive, and Ethical AI Policies: Developing regulations for fair, inclusive, and ethical AI use.*

➢ *Master Plans for AI Integration in Education: Creating comprehensive plans for AI usage in education management, teaching, learning, and assessment.*

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[1] *Castellanos-Gomez, A,* ***Good Practices For Scientific Article Writing With Chat-GPT And Other Artificial Intelligence Language Models****, Nano-manufacturing, Issue 3. 2023, April 12, P.135.*

[2] *Sabzalieva & Valentini, Op.Cit, P.12.*

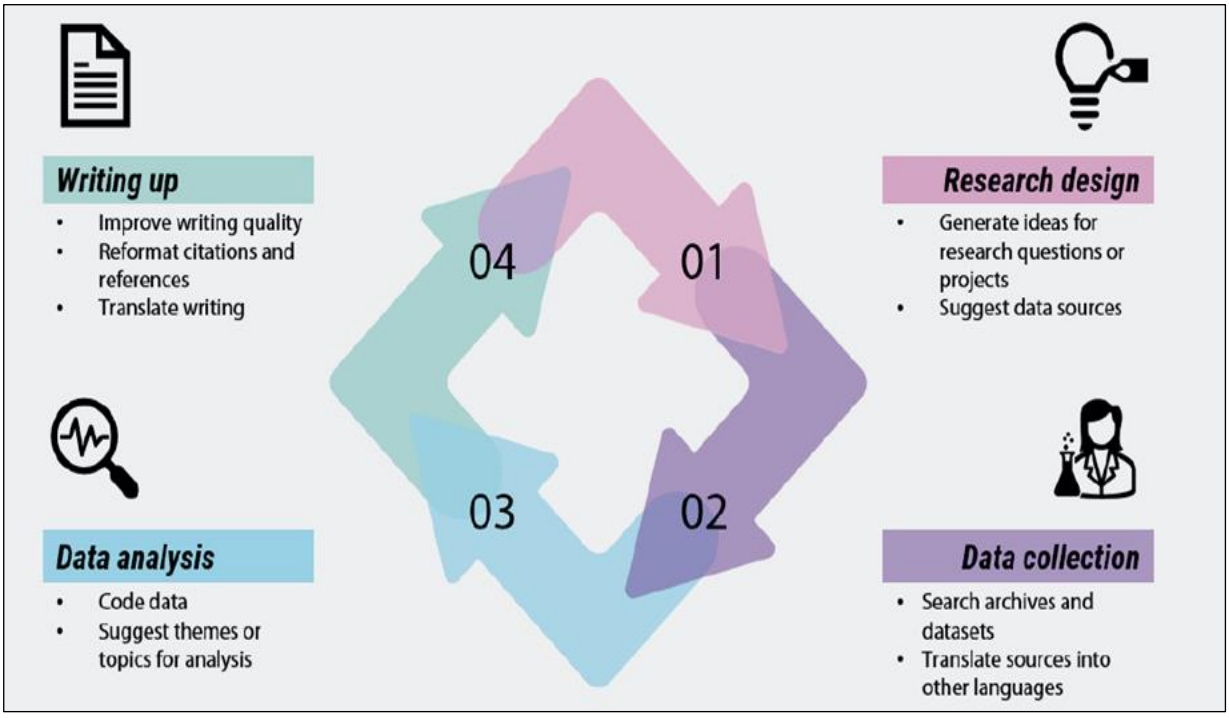
➢ *Pilot Testing, Monitoring, and Evaluation: Implementing trials, monitoring, and establishing an evidence-based approach.*

➢ *Fostering Local AI Innovations for Education: Encouraging the development of local AI innovations for educational purposes.*

2.4 Critical thinking and problem-solving skill[1]:

Chat-GPT has the ability to produce mostly accurate responses to technical queries spanning various subjects. It can also rectify or provide partially accurate programming code by interpreting problem descriptions, algorithms, and related details. Nonetheless, solely relying on Chat-GPT for answers and code might impede the enhancement of learners' critical thinking and problem-solving abilities. The necessity for educators to address this emerging scenario, given the absence of tools capable of identifying code generated by AI models. Consequently, AI-generated solution codes could potentially be utilized in academic coding assessments and competitions. To clarify the above, we put the following figure:

Figure (2): Possible uses of Chat-GPT in the research process:



Source: Sabzalieva & Valentini, OP.CIT, P.10.

[1] *Mostafizer Rahman, M., & Watanobe, Y.* ***Chat-GPT for Education and Research. Applied Sciences****, Volume 13, Issue 9, 2023, May 8, P.17.*

2.5 Chat-GPT's Transformative Impact on Scientific Research:

Chat-GPT: Transformative Influence on Research[1]:

Chat-GPT carries the potential to transform the landscape of education. Its impact ranges from offering tailored, interactive explanations to students grappling with complex concepts, thereby aiding their comprehension. Furthermore, this AI-powered system streamlines the process for educators, enabling them to furnish personalized feedback to individual students, thus conserving time and effort. It extends its utility to grading assignments and tests, automating the feedback process. Beyond these applications, Chat-GPT facilitates the creation of innovative educational resources and projects. For instance, it can develop interactive games and activities that significantly engage students, and it can also design intelligent tutors offering personalized guidance and feedback to aid students in their learning journey.

3. Empowering Scientific Research: Chat GPT's Multifaceted Potential[2]:

Chat-GPT holds substantial potential for various applications that can significantly bolster scientific research, such as:

➢ *Generating coherent, high-quality text in response to prompts, facilitating the writing of manuscripts, proposals, and aiding in effectively communicating research findings.*

➢ *Categorizing extensive datasets using predetermined labels, thereby empowering researchers to identify patterns, trends, and correlations.*

➢ *Extracting pertinent information from vast datasets, such as medical records, academic papers, or social media posts.*

➢ *Offering tailored recommendations that align with researchers' individual interests, skills, and objectives, aiding them in staying updated and making well-informed decisions.*

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[1] *Kalla, D., & Smith, N. (). **Study and Analysis of Chat GPT and Its Impact on Different Fields of Study**. International Journal of Innovative Science and Research Technology, Volume 08, Issue 3, 2023, March 24, P.831.*

[2] *Obaid, O., & Ali, A. **Impact of Chat GPT on Scientific Research: Opportunities, Risks, Limitations, and Ethical Issues**. Iraqi Journal for Computer Science and Mathematics, Volume 04, Issue 04, 2023, September 21, P14.*

In essence, Chat GPT stands poised to greatly expedite discoveries and enhance the efficiency and effectiveness of research endeavors.

3.1 Chat-GPT's Multifaceted Role in Personalizing Higher Education and Training:

In higher education and training, Chat-GPT plays multiple roles. It customizes learning materials and study plans to meet individual learner needs, guides educational paths, assists in student assessments and online discussions, and develops personalized education plans based on student preferences. It also provides tailored recommendations for study resources and activities, helps teachers improve lessons, supports language learning with vocabulary and pronunciation tips, and aids efficient exam preparation through analysis of past performance and preferred learning styles.

3.2 Critical thinking and problem-solving skill[1]:

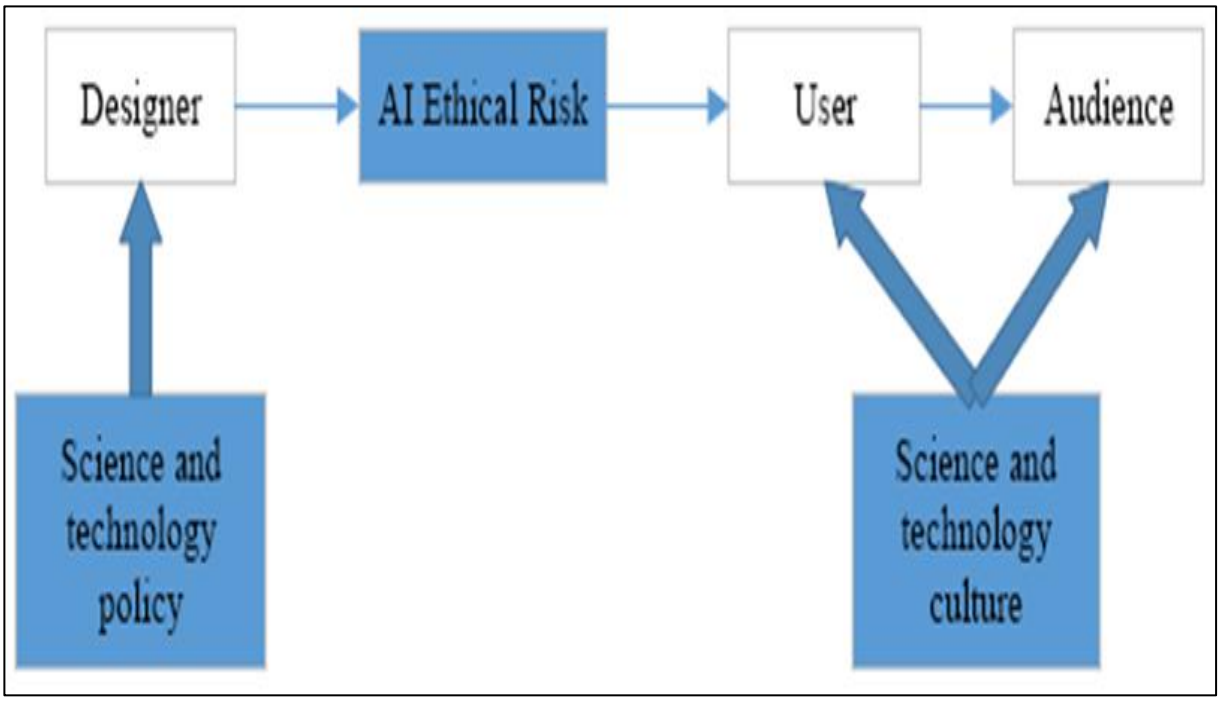
Chat-GPT has the ability to produce mostly accurate responses to technical queries spanning various subjects. It can also rectify or provide partially accurate programming code by interpreting problem descriptions, algorithms, and related details. Nonetheless, solely relying on Chat-GPT for answers and code might impede the enhancement of learners' critical thinking and problem-solving abilities. The necessity for educators to address this emerging scenario, given the absence of tools capable of identifying code generated by AI models. Consequently, AI-generated solution codes could potentially be utilized in academic coding assessments and competitions.

3.3 Ethical issues of Chat-GPT in scientific research:

Integrating Chat-GPT into scientific research raises critical ethical considerations. It involves accessing sensitive data like medical records or social media, risking privacy and confidentiality. Researchers must secure informed consent and offer opt-out options. Bias from the model's training data can lead to discriminatory outcomes. Concerns also include content duplication, plagiarism, and misinformation propagation. Ethical guidelines are essential to ensure responsible use, emphasizing privacy, consent, and accountability in research practices.

[1] *Mostafizer Rahman, M., & Watanobe, Y, OP.CIT, P.17.*

Figure (3): Schematic diagram of artificial intelligence ethical risk prevention framework



Source: (Li, An, & Zhang, 2021, p. 3)

4. Study' Analytical framework

To analyze the article Ethical Dilemma and Bias in Scientific Research, we relied on the following:

4.1 Methodology:

Information Gathering:

Analyzed the provided information, including the theoretical framework and specific questions about Chat-GPT's bias.

Accessed and processed the provided references using the context and keywords surrounding Chat-GPT and bias in scientific research.

Conducted additional research using my knowledge base and external sources to find relevant scholarly articles and publications addressing the topic.

Information Synthesis and Analysis:

Identified key themes and concepts related to Chat-GPT's bias in scientific research from the gathered information.

Critically evaluated the sources by considering their credibility, relevance, and potential biases.

Analyzed the various perspectives and arguments presented in the sources to form a comprehensive understanding of the topic.

4.2 Discussion and results:

4.2.1 Answering research questions':

Answer to first sub-question: How does Chat-GPT's training data contribute to potential biases in its responses?

•Biases in the training data: Chat-GPT is trained on a massive dataset of text and code, which may reflect existing biases in society and language. These biases can manifest in the model's outputs, leading to discriminatory or unfair responses. For example, if the training data contains gender stereotypes, Chat-GPT might generate responses that perpetuate these stereotypes.

•Algorithmic bias: Even if the training data is unbiased, the algorithms used to train Chat-GPT might introduce bias. This can happen if the algorithms are not designed to be fair and equitable, or if they are not properly evaluated for bias.

•Data selection: The selection of data used to train Chat-GPT can also introduce bias. If the data is not representative of the population of interest, the model's outputs may be skewed.

Answer to second sub-question: Are there existing ethical frameworks that address bias in artificial intelligence, and how applicable are they to the context of Chat-GPT in scientific research?

•Existing frameworks: Several ethical frameworks have been developed to address bias in AI, such as the Asilomar AI Principles and the Montreal Declaration for Responsible AI. These frameworks outline principles such as fairness, non-discrimination, and transparency, which can be applied to the development and use of Chat-GPT.

•Challenges: Applying existing frameworks to Chat-GPT in scientific research can be challenging. For example, it may be difficult to determine the source of bias in a particular output, or to develop algorithms that are guaranteed to be fair and unbiased. Additionally, some ethical principles, such as transparency, may conflict with the need for scientific confidentiality.

Answer to third sub-question: What challenges might be encountered in developing a standardized framework to address bias in Chat-GPT for scientific research?

•Complexity: Bias is a complex concept, and there is no single agreed-upon definition. This makes it difficult to develop a standardized framework that can address all types of bias.

•Contextual dependence: The meaning and impact of bias can vary depending on the context in which it occurs. This makes it difficult to develop a framework that is applicable to all types of scientific research.

•Trade-offs: Addressing bias often involves trade-offs with other values, such as accuracy or efficiency. Developing a framework that balances these trade-offs can be challenging.

Answer to fourth sub-question: How might biased outputs from Chat-GPT impact the credibility and reliability of scientific research, and what potential benefits could be gained from using Chat-GPT in research, weighing against ethical concerns?

•Risks: Biased outputs from Chat-GPT could lead to misleading or inaccurate conclusions in scientific research. This could damage the credibility and reliability of research findings, and potentially even harm research participants.

•Benefits: Despite the risks, Chat-GPT has the potential to offer several benefits to scientific research. For example, it can be used to generate new hypotheses, to analyze large datasets, and to communicate research findings to a wider audience.

•Balancing risks and benefits: It are important to carefully weigh the risks and benefits of using Chat-GPT in scientific research, and to take steps to mitigate the risks. This may involve developing guidelines for the ethical use of Chat-GPT, and training researchers to be aware of the potential biases of the model.

4.2.2 Answer of the main question:

Addressing bias in Chat-GPT for scientific research is no magic bullet. Standardized frameworks offer potential benefits like transparency and consistency, but face challenges like defining and adapting to diverse research contexts. Ultimately, a successful approach likely requires a combination of frameworks, critical thinking, and continuous ethical considerations alongside

researcher responsibility. The key is not a one-size-fits-all answer, but a flexible and evolving approach tailored to the specific challenges of each research.

4.2.3 Results:

This research examined the potential for bias in Chat-GPT and its implications for scientific research. Key findings include:

Prevalence of Bias:

Chat-GPT's training data, algorithms, and data selection methods can all introduce bias, potentially leading to discriminatory or unfair responses.

Gender stereotypes were cited as an example of how biases in the training data can manifest in outputs.

Ethical Framework:

Existing ethical frameworks like Asilomar AI Principles and Montreal Declaration for Responsible AI address AI bias but face challenges in application to Chat-GPT.

Challenges include difficulty pinpointing the source of bias, developing truly fair algorithms, and balancing transparency with confidentiality in scientific contexts.

Standardized Framework Challenges:

Developing a standardized framework to address bias in Chat-GPT for scientific research faces several hurdles:

The complex and context-dependent nature of bias makes it difficult to design a universally applicable framework.

Trade-offs between mitigating bias and other values like accuracy or efficiency need careful consideration.

Impact on Research:

Biased outputs from Chat-GPT can damage the credibility and reliability of research findings, potentially harming participants.

Conversely, Chat-GPT offers benefits like generating hypotheses, analyzing data, and communicating research more broadly.

Balancing these risks and benefits necessitates careful consideration, ethical use guidelines, and researcher training on model bias awareness.

***Conclusion**:*

In conclusion, the integration of Chat-GPT in scientific research demands a careful balance between innovation and ethical responsibility. Researchers must be vigilant in ensuring that the use of this tool aligns with principles of transparency, fairness, and privacy protection.

Addressing biases in data and algorithms is critical to maintaining the integrity of research outcomes, while existing ethical frameworks should be adapted to meet the unique challenges posed by Chat-GPT in this context. Ultimately, Chat-GPT should be viewed as a complementary tool that enhances, rather than replaces, human judgment and critical thinking. As technology continues to evolve, so too must the ethical standards be guiding its use, ensuring ongoing relevance and responsible application across research fields.

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