

# **The Role of Artificial Intelligence in Writing Scientific Research: Challenges and Trends**

## **(A Case Study Zaytoonah International University MA Students of English Language 2023–2024)**

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### **Abstract**

The study aimed to investigate the current role of artificial intelligence (AI) in the writing of scientific research papers and to identify the challenges that researchers face when using AI in writing scientific research. The sample of this study consists of ESL learners who are currently pursuing writing scientific research in their academic program. The researcher adopted a descriptive and analytical method .He used a questionnaire as a tool for the study and SPSS as a program for analyzing data. The study revealed that, Efforts should be made to enhance AI models' understanding of complex scientific concepts by exploring techniques like pre-training on scientific literature or incorporating domain-specific knowledge bases during the training process. Researchers and scientific communities should collaborate to ensure the availability and sharing of high-quality datasets for training AI models. The study recommends that AI in scientific research writing raises ethical concerns, particularly in terms of authorship and plagiarism. Questions may arise regarding the appropriate attribution of AI-generated content, as well as the potential for AI models to mimic the work of specific researchers or labs. And Major challenge in AI for writing

scientific research is the limited understanding of complex scientific concepts by AI models.

**Keywords :** Artificial intelligence , Scientific Research , challenges , Trends

### الملخص

هدفت الدراسة إلى استكشاف الدور الحالي للذكاء الاصطناعي في كتابة الأبحاث العلمية وتحديد التحديات والاتجاهات التي يواجهها الباحثون عند استخدام الذكاء الاصطناعي في كتابة الأبحاث العلمية، تتكون عينة هذه الدراسة من طلاب اللغة الإنجليزية كلغة ثانية الذين يقومون حاليًا بكتابة أبحاث علمية في برنامجهم الأكاديمي، اعتمد الباحث على المنهج الوصفي والتحليلي، واستخدم الاستبيان كأداة للدراسة وبرنامج الحزم الإحصائية للعلوم الاجتماعية لتحليل البيانات. كشفت الدراسة أن الجهود يجب أن تُبذل لتعزيز فهم نماذج الذكاء الاصطناعي للمفاهيم العلمية المعقدة من خلال استكشاف تقنيات مثل التدريب المسبق على الأدبيات العلمية أو دمج قواعد المعرفة الخاصة بالمجال أثناء عملية التدريب. يجب على الباحثين والمجتمعات العلمية التعاون لضمان توفر ومشاركة مجموعات بيانات عالية الجودة لتدريب نماذج الذكاء الاصطناعي. توصي الدراسة بأن الذكاء الاصطناعي في كتابة الأبحاث العلمية يثير قضايا أخلاقية، خصوصًا فيما يتعلق بالملكية الفكرية والانتحال. قد تثار أسئلة حول الإسناد المناسب للمحتوى الذي يتم إنشاؤه بواسطة الذكاء الاصطناعي، وكذلك احتمالية أن تحاكي نماذج الذكاء الاصطناعي أعمال باحثين أو مختبرات معينة. كما أن التحدي الرئيسي للذكاء الاصطناعي في كتابة الأبحاث العلمية هو الفهم المحدود للمفاهيم العلمية المعقدة من قبل نماذج الذكاء الاصطناعي

**الكلمات المفتاحية:** الذكاء الاصطناعي، البحث العلمي، التحديات، الاتجاهات.

### Introduction

In modern times, Artificial Intelligence (AI) has become a crucial and rapidly advancing field of technology. AI as program refers to human intelligence in machines that are designed to think and learn like humans. It consist of different sub fields such as E learning, natural language processing, computer vision, and robotics. AI has found applications in multiple sectors including healthcare, finance, transportation, and entertainment, among others. One of the key drivers behind the growth of AI in modern times is the availability of large amounts of data. The proliferation of smartphones, connected devices, social media platforms, and e-commerce websites has generated massive data sets that can be used to train AI algorithms. This has led to the development of highly accurate and efficient AI models.

AI has witnessed significant progress recently. Deep learning, a branch of machine learning that utilizes neural networks with multiple layers, has revolutionized the AI field. Deep learning models have achieved remarkable success in image and speech recognition tasks, beating human performance in some cases (1). For instance, Google's AlphaGo, an AI system powered by deep learning, defeated a world champion in the ancient Chinese board game Go (2). Natural language processing (NLP) is another way where AI has progress in. NLP focuses on enabling machines to comprehend and respond to human language. Modern-day virtual assistants like Amazon's Alexa, Apple's Siri, and Google Assistant are powered by NLP technologies, allowing users to interact with them using natural language commands. AI is also gaining traction in healthcare, where it is being utilized for various purposes.

Machine learning algorithms have been developed to diagnose diseases from medical images like X-rays and scans, often with better accuracy than human doctors (3). AI is also being used for drug discovery, personalized medicine, and predicting patient outcomes.

Financial institutions are integrating AI algorithms into their operations to automate processes, enhance fraud detection, and improve customer experience. AI-powered chatbots are being used to handle customer inquiries, reducing waiting times and improving customer satisfaction.

Transportation is another sector where AI is being extensively used. Companies like Tesla and Waymo are investing heavily in developing autonomous vehicle technologies (4).

AI's impact in the entertainment industry is also noteworthy. Streaming services like Netflix and Spotify use AI algorithms to analyze user preferences and make personalized recommendations. This has transformed the way content is consumed and has significantly improved user experience.

Artificial Intelligence (AI) has emerged as a powerful tool in various domains, including scientific research. This literature review aims to explore the role of AI in writing scientific research, focusing on the challenges and trends associated with its implementation. By examining recent studies and advancements, this review seeks to

provide insights into the potential benefits and limitations of AI in Writing scientific research.

In conclusion, AI has emerged as a powerful technology in modern times. It has witnessed rapid advancements, thanks to the availability of big data and breakthroughs in machine learning and NLP. Its applications span across multiple sectors and have the potential to revolutionize industries. However, ethical concerns and challenges related to privacy and security need to be addressed for the responsible and sustainable development of AI.

### **1-Statement problem**

The researcher writes about the role of AI in writing scientific research because it is a topic that he finds fascinating and relevant in today's rapidly evolving technological landscape. AI is increasingly being used in various fields to enhance productivity and efficiency, and its impact on scientific research writing is no exception. Exploring the challenges and trends related to AI in scientific research writing allows researchers to better understand the potential benefits and limitations of incorporating AI technologies in the research process. By delving into this topic, they can gain insights into how AI can be leveraged to improve scientific writing practices, as well as identify areas where human intervention and expertise are still crucial. Overall, discussing the role of AI in writing scientific research helps shed light on the developing relationship between technology and academia, and how researchers can effectively navigate this changing background to produce high-quality research outputs.

### **2-The objectives of the Study**

1. To investigate the current role of artificial intelligence (AI) in the writing of scientific research papers.
2. To identify the challenges that researchers face when using AI in writing scientific research.
3. To explore the trends in the use of AI for writing scientific research papers.
4. To examine the impact of AI on the quality and efficiency of scientific research writing.
5. To provide recommendations for researchers and institutions on how to effectively leverage AI for writing scientific research papers.

### 3–Hypotheses Study

1. The use of AI is contributing to the challenges faced in scientific research writing by altering the traditional role of human researchers and potentially introducing errors into the content.
2. Current limitations and potential biases of AI in generating scientific research content may hinder the accuracy and reliability of the information produced.
3. AI can help researchers in overcoming language barriers and increase scientific collaborations by providing translation services and facilitating communication between researchers from different linguistic backgrounds.
4. The potential risks and vulnerabilities associated with the use of AI in writing scientific research papers include the possibility of introducing biased or inaccurate information into the content.
5. Challenges and future prospects of integrating AI into the peer-review process of scientific research papers include concerns about bias, accountability, and the impact on the traditional peer-review system.

### 4–Questions of the Study

1. How is the use of AI contributing to the challenges faced in scientific research writing?
2. What are the current limitations and potential biases of AI in generating scientific research content?
3. How can AI help researchers in overcoming language barriers and increase scientific collaborations?
4. What are the potential risks and vulnerabilities associated with the use of AI in writing scientific research papers?
5. What are the challenges and future prospects of integrating AI into the peer-review process of scientific research papers?

### 5. Significance of the Study

This study will provide insights into the challenges faced by ESL learners in utilizing AI tools for scientific research and shed light on the emerging trends in this domain. The findings will contribute to the existing literature on AI in education and provide

recommendations for educators and policymakers to enhance ESL learners' integration of AI in writing scientific research.

### **6. Limitations:**

The study's generalizability may be limited due to the specific focus on ESL learners and the selected sample.

The study's findings are subject to the participants' honesty and accuracy in their responses.

## **2 Literature Review**

### **Several Challenges in AI in Writing Scientific Research**

1. Understanding complex scientific concepts: AI systems need to comprehend and correctly interpret complex scientific concepts to generate accurate research papers. However, understanding these intricate concepts poses challenges due to the ambiguity and complexity of scientific language. (Malarvizhi, P., & Wilson, D, 2020).
2. Handling domain-specific language and jargon: Scientific research involves the use of domain-specific language and jargon. These terms may have unique meanings within specific scientific communities or fields. AI systems need to be trained in these specific domains to effectively generate scientifically valid content. (Ramanan, *et al*, 2019).
3. Ensuring scientific accuracy and reliability: Accuracy and reliability are critical in scientific writing. AI systems need to validate the information they generate and ensure that it aligns with established scientific. Elhadad, N., & Sutaria, R, 2018)
4. Contextual understanding and inference: AI systems should possess the ability to contextualize information, make accurate inferences, and comprehend the scope and limitations of different scientific studies or experiments. Vrooman, J., & Liu, H. (2020)
5. Generating coherent and well-structured papers: Writing scientific research requires a coherent structure and logical flow of ideas. AI systems should be able to generate well-organized and cohesive papers that meet the specific requirements and standards of scientific research writing. (Gkatzia, *et al.*, 2019).

It's important to note that AI in scientific research writing is still an active area of research and development, and these challenges are constantly being addressed and improved upon by researchers in the field.

## **2–Several Trends in the Use of Artificial Intelligence (AI) in writing scientific Research.**

1. Automated Literature Reviews: AI algorithms can quickly analyze and summarize large amounts of scientific literature, helping researchers identify relevant papers and extract key information. This significantly speeds up the literature review process and assists in synthesizing knowledge. (Gligorijević V., & Jelier, R., 2014).
2. AI-Based Writing Assistance: AI tools are being developed to help researchers write scientific papers more effectively. These tools can provide suggestions for structuring papers, improving language fluency, and offering relevant citations, thus facilitating the writing process. (Nishio, M., & Fujita, M,2021) .
3. AI-Generated Research Abstracts: Some AI models have been trained to generate abstracts summarizing the key findings of research papers. This allows scientists to quickly grasp the essence of a study without having to read the entire paper. (Auto et al. 2020).
4. AI-Driven Data Analysis and Visualization: AI algorithms are increasingly used to analyze large datasets, enabling more sophisticated data mining techniques and improving visualization of complex scientific findings. This helps researchers gain valuable insights and discover patterns that might otherwise be overlooked. (Zhang, Y., & Zhao, Y, 2021)
5. AI-Powered Peer Review: AI is being explored as a tool to assist in the peer-review process. Automated systems can evaluate the quality, relevance, and novelty of submitted papers, helping reviewers assess potential biases and anomalies in the research. (Tomkins, *et al*/2017).

These trends highlight how AI is revolutionizing scientific research by expediting various stages, from literature review to writing and analysis. However, it is worth noting that AI tools are still evolving, and human oversight is essential to ensure the accuracy and ethical compliance of research outputs.

## **3–The Methodology**

### **1. The Methodology of the study**

The study will employ a mixed-methods research design, which includes both qualitative and quantitative data collection and analysis techniques. The research will

be conducted in multiple phases to ensure a comprehensive understanding of the AI role in scientific research among ESL learners.

## 2. Population and Sample Selection

The population of this study will consist of ESL learners who are currently pursuing writing scientific research in their academic program. A purposive sampling technique will be utilized to select a representative sample of ESL learners, ensuring diversity in terms of age, gender, and academic institutions.

## 3. Data Analysis

Data will be analyzed using descriptive statistical methods, such as frequency distributions and percentages, to summarize the survey results.

## 4-Results and Discussion:

Table(1)

	N	Minimum	Maximum	Sum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
statement1	30	1.00	3.00	51.00	1.7000	.14503	.79438
statement2	30	1.00	3.00	39.00	1.3000	.09767	.53498
statement3	30	1.00	3.00	59.00	1.9667	.14765	.80872
statement4	30	1.00	1.00	30.00	1.0000	.00000	.00000
statement5	30	1.00	3.00	52.00	1.7333	.13505	.73968
statement6	30	1.00	3.00	46.00	1.5333	.14169	.77608
statement7	30	1.00	3.00	54.00	1.8000	.16189	.88668
statement8	30	1.00	3.00	55.00	1.8333	.14450	.79148
statement9	30	1.00	3.00	59.00	1.9667	.14765	.80872
statement10	30	1.00	3.00	45.00	1.5000	.14971	.82001
Valid N (list wise)	30						

1. AI can effectively assist in writing scientific research papers.

**Table(2)**

Valid	Frequency	Valid Percent
Agree	15	50.0
Not sure	9	30.0
Disagree	6	20.0
Total	30	100.0

Based on the data presented in the table (1) and (2) it is clear that a half of the samples responses are in agreement with the assumption ,the frequency is (15) they constitute (50%).

2-AI may lack the ability to comprehend and provide accurate analysis in scientific research. As seen from the data presented in the table (2) it is clear that two third of the samples responses are in agreement with the assumption, the frequency is (15) they constitute (50%).

3- AI is capable of generating new ideas.

**Table(3)**

Valid	Frequency	Valid Percent
Agree	10	33.3
Not sure	11	36.7
Disagree	9	30.0
Total	30	100.0

In the table (3) it is clear that third of the samples responses are in agreement with the assumption, the frequency is (10) they constitute (33.3%).

4-AI can help in reducing the time.

**Table(4)**

Valid	Frequency	Valid Percent
Agree	30	100.0

From the data presented in the table (4) it is clear that a whole of the samples responses are in agreement with the assumption ,the frequency is (30) they constitute (100.%)..

5.AI may struggle to understand the contextual information

**Table(5)**

Valid	Frequency	Valid Percent
Agree	13	43.3
Not sure	12	40.0
Disagree	5	16.7
Total	30	100.0

In the table (5) it is clear that more than third of the samples responses are in agreement with the assumption, the frequency is (13) they constitute (43.3%). and showed that more than third of participants agreed that the impact of AI may struggle to understand the contextual information.

6-AI has the potential to revolutionize the way in scientific research.

**Table(6)**

Valid	Frequency	Valid Percent
Agree	19	63.3
Not sure	6	20.0
Disagree	5	16.7
Total	30	100.0

According to the e data presented in the table (6) it is clear that most of the samples responses are in agreement with the assumption, the frequency is (19) they constitute

(63.3%). and showed that two third of participants agree that AI has the potential to revolutionize the way in scientific research.

7.AI technologies may result in a decline in the quality of scientific research .

**Table(7)**

Valid	Frequency	Valid Percent
Agree	15	50.0
Not sure	6	20.0
Disagree	9	30.0
Total	30	100.0

In the table (7) it is clear that a half of the samples responses are in agreement with the assumption ,the frequency is (15) they constitute (50.%). and showed that a half of participants agreed that the AI technologies may result in a decline in the quality of scientific research.

8- AI can help in identifying errors in scientific research papers.

**Table(8)**

Valid	Frequency	Valid Percent
<b>Agree</b>	<b>12</b>	<b>40.0</b>
<b>Not sure</b>	<b>11</b>	<b>36.7</b>
<b>Disagree</b>	<b>7</b>	<b>23.3</b>
<b>Total</b>	<b>30</b>	<b>100.0</b>

According to the e data presented in the table (8) it is clear that more than third of the samples responses are in agreement with the assumption ,the frequency is (12) they constitute (40.%). and showed that above third of participants agree that AI can help in identifying errors in scientific research papers.

9- AI can accurately analyze research .

According to the e data presented in the table (9) it is clear that a third of the samples responses are in agreement with the assumption ,the frequency is (10) they constitute (33.%).

**Table(9)**

Valid	Frequency	Valid Percent
<b>Agree</b>	<b>10</b>	<b>33.3</b>
<b>Not sure</b>	<b>11</b>	<b>36.7</b>
<b>Dis agree</b>	<b>9</b>	<b>30.0</b>
<b>Total</b>	<b>30</b>	<b>100.0</b>

and (9) showed that third of participants agree that AI can accurately analyze research. 10-AI may struggle to adapt to the ever-evolving nature of scientific research.

**Table(10)**

Valid	Frequency	Valid Percent
<b>Agree</b>	<b>21</b>	<b>70.0</b>
<b>Not sure</b>	<b>3</b>	<b>10.0</b>
<b>Disagree</b>	<b>6</b>	<b>20.0</b>
<b>Total</b>	<b>30</b>	<b>100.0</b>

According to the e data presented in the table (10) it is clear that more than two third of the samples responses are in agreement with the assumption, the frequency is (21) they constitute (70. %). and showed that more than two third of participants agree that AI may struggle to adapt to the ever-evolving nature of scientific research.

### **Findings:**

1. Major challenge in AI for writing scientific research is the limited understanding of complex scientific concepts by AI models. These models often struggle to grasp the intricate nuances and context required for producing high-quality scientific papers.
2. AI models heavily rely on large volumes of high-quality data for training, but obtaining such data in the scientific domain can be challenging due to restrictions on data access or limited availability of labeled datasets.
3. AI in scientific research writing raises ethical concerns, particularly in terms of authorship and plagiarism. Questions may arise regarding the appropriate attribution

of AI-generated content, as well as the potential for AI models to mimic the work of specific researchers or labs.

4. Recent advancements in natural language processing, such as the development of transformer models like GPT-3, have shown promising potential in improving AI's ability to understand and generate scientific research.

5. Integrating AI models with domain-specific knowledge bases, such as biomedical databases or repositories of scientific literature, can help overcome the challenge of limited data availability and improve the accuracy and relevance of the generated scientific content.

6. Collaboration between researchers and AI systems can yield better outcomes. Researchers can provide guidance and input to the AI models, helping them understand scientific concepts better.

### **Recommendations:**

1. Efforts should be made to enhance AI models' understanding of complex scientific concepts by exploring techniques like pre-training on scientific literature or incorporating domain-specific knowledge bases during the training process.

2. Researchers and scientific communities should collaborate to ensure the availability and sharing of high-quality datasets for training AI models. This can be accomplished through the establishment of data repositories or the facilitation of collaboration platforms.

3. It is essential to establish ethical guidelines for the use of AI in scientific research writing. These guidelines should address concerns related to authorship, plagiarism, and attribution of AI-generated content, allowing for responsible and ethical integration of AI systems in scientific publishing.

4. Continuous research and development efforts should be undertaken to keep pace with the rapid advancement of AI technology. Ongoing exploration of novel techniques in natural language processing and knowledge integration will be vital in further enhancing AI's capabilities in scientific research writing.

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