



Artificial Intelligence In The Future Of Iraqi Healthcare System

Kecerdasan Buatan Di Masa Depan Sistem Layanan Kesehatan Irak

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Abstract. *The expansion of healthcare AI in Iraq highlights the growing necessity for AI education among medical students. The aim of this research is to explore the perspectives of medical students in Iraq regarding artificial intelligence (AI), including their understanding of AI and their career aspirations. Methodologically, a group of Iraqi medical students were invited to participate in an anonymous electronic survey. The collected data were analyzed using SPSS21 software. This statistical analysis allowed for the examination of patterns, trends, and relationships within the data, providing valuable insights into the participants' responses and perspectives on AI in medical education. The results indicate that a total of 318 responses were collected from 22 medical colleges. The majority of respondents (91.5%, $s = 291$) hold the belief that AI will have a significant impact on healthcare in the future. Specifically, their responses were categorized as strongly agreeing (33.6%, $s = 107$) or agreeing (57.9%, $s = 184$). This research reveals that Iraqi medical students recognize the significance of AI and are enthusiastic about engaging with this technology. Moreover, it suggests that there is a need to expand and enhance medical college training on AI to ensure that future healthcare professionals are well-prepared in this domain.*

Keywords- *Artificial Intelligence, Healthcare, Medical Students.*

Abstrak. *Perluasan AI layanan kesehatan di Irak menyoroti meningkatnya kebutuhan akan pendidikan AI di kalangan mahasiswa kedokteran. Tujuan dari penelitian ini adalah untuk mengeksplorasi perspektif mahasiswa kedokteran di Irak mengenai kecerdasan buatan (AI), termasuk pemahaman mereka tentang AI dan aspirasi karir mereka. Secara metodologis, sekelompok mahasiswa kedokteran Irak diundang untuk berpartisipasi dalam survei elektronik anonim. Data yang terkumpul dianalisis menggunakan perangkat lunak SPSS21. Analisis statistik ini memungkinkan dilakukannya pemeriksaan pola, tren, dan hubungan dalam data, sehingga memberikan wawasan berharga mengenai tanggapan dan perspektif peserta tentang AI dalam pendidikan kedokteran. Hasilnya menunjukkan total 318 tanggapan dikumpulkan dari 22 perguruan tinggi kedokteran. Mayoritas responden (91,5%, $s = 291$) yakin bahwa AI akan berdampak signifikan terhadap layanan kesehatan di masa depan. Secara khusus, tanggapan mereka dikategorikan sangat setuju (33,6%, $s = 107$) atau setuju (57,9%, $s = 184$). Penelitian ini mengungkapkan bahwa mahasiswa kedokteran Irak menyadari pentingnya AI dan antusias untuk menggunakan teknologi ini. Selain itu, hal ini menunjukkan adanya kebutuhan untuk memperluas dan meningkatkan pelatihan perguruan tinggi kedokteran tentang AI untuk memastikan bahwa profesional kesehatan di masa depan memiliki persiapan yang baik dalam bidang ini.*

Kata Kunci- *Kecerdasan Buatan, Pelayanan Kesehatan, Mahasiswa Kedokteran.*

INTRODUCTION

Artificial Intelligence (AI) stands at the forefront of technological innovation, representing a transformative force that has redefined the way we interact with machines, process data, and make decisions [1]. AI is a multidisciplinary field of computer science that seeks to create intelligent systems capable of simulating human-like cognitive

functions, such as learning, problem-solving, and adaptation[1]. Its applications span a wide range of industries, from healthcare and finance to transportation and entertainment, revolutionizing the landscape of automation and human-computer interaction. As AI continues to evolve and mature, its potential to reshape our world and address complex challenges remains virtually limitless, making it one of the most captivating and dynamic fields of our time[1].

"Artificial Intelligence (AI)" was introduced by John McCarthy in 1956 at a conference dedicated to this field. Nevertheless, the notion of machines emulating human behavior and engaging in genuine thought processes was previously contemplated by Alan Turing, who devised the Turing test to distinguish between humans and machines. Since that time, computational capabilities have advanced significantly, enabling instantaneous calculations and real-time assessment of new data based on previously processed information.

In the present day, AI has seamlessly woven into our everyday existence through various manifestations, including personal assistants like Siri, Alexa, and Google Assistant, as well as its integration in automated mass transit, aviation, and the realm of computer gaming. Additionally, AI has made notable inroads into the field of medicine, enhancing patient care by expediting procedures and enhancing precision, thereby paving the way for overall improvements in healthcare delivery [2].

When consulting physicians about the pivotal elements in ensuring effective patient care, two fundamental words invariably emerge: knowledge and experience. The more one is informed and the greater the exposure to diverse patient cases, the higher the quality of care they can deliver. Typically, this competence is cultivated over time, with healthcare professionals accumulating knowledge and expertise as they engage in patient care and pursue ongoing educational pursuits aligned with their specific interests. This principle of fusing experience and knowledge forms the crux of comprehending the role of artificial intelligence in the field of medicine. The greater the repository of experience and data, achieved through the analysis of information, the more adept we become at making knowledge-driven decisions. Data can be sourced from evidence-based medical resources such as textbooks and peer-reviewed research publications, while experience is garnered from real-world outcomes in patient treatment, encompassing patient records, laboratory findings, and radiological data. The primary constraint for human cognition in managing extensive datasets primarily lies in the constraints of time. The learning process necessitates the assimilation of knowledge and experience, honed over years of practice. In the era of

silicon chips, we now have the capacity to access, collect, and store vast reservoirs of patient data for analysis. The cornerstone of AI lies in harnessing these immense data repositories and converting them into experiential insights [3, 4]. Computer software through the application of algorithms, thus can gain far more experience in a significantly shorter amount of time than human subjects can acquire in their lifetime.

Artificial intelligence (AI) is the expression employed to portray the utilization of computers and technology to replicate intelligent actions and analytical reasoning akin to those of a human being. In 1956, John McCarthy initially coined the term AI, characterizing it as the discipline and art of constructing intelligent machines [5].

AI's application within the field of medicine can be categorized into two primary subdivisions: the virtual domain and the physical domain. The virtual aspect encompasses a spectrum of applications, including electronic health record systems and the utilization of neural networks for guidance in treatment decisions. The physical aspect involves the deployment of robots to assist in surgical procedures, the development of intelligent prosthetics to aid individuals with disabilities, and innovations in elderly care [2].

AI has found numerous applications in the field of medicine, spanning areas like pharmaceutical research, business analytics, and the provision of patient care. Its utilization extends to clinical decision support tools as well. To ensure that clinicians are at ease with the role of AI in aiding decision-making, trust emerges as a crucial element. Trust can be shaped by a variety of human factors, encompassing user education, prior encounters, individual predispositions, attitudes toward automation, as well as the characteristics and dependability of the technology itself [6, 7].

The expansion of healthcare AI in Iraq highlights the growing necessity for AI education among medical students. This research endeavor seeks to comprehend the perspectives of Iraqi medical students regarding AI and investigate the potential impact of AI on their future careers. Additionally, it gathers data on medical students' comprehension of AI

and evaluates their confidence levels in collaborating with AI in the forthcoming years.

MATERIAL and METHODS

Iraqi medical college students were asked to take part in an online survey utilizing Google Forms as shown in figure1 . The students were directly approached and encouraged to complete the survey via social media platforms, while additional efforts were made to collaborate with medical colleges to ensure widespread distribution of the survey through online channels. Only students possessing a valid email address from their respective medical colleges were eligible to partake in the survey. students were duly notified that their response would remain anonymous. The survey's structure was meticulously designed by a team of AI experts and medical professionals who possess a keen interest in the field of AI. Consisting of 13 questions in total, the survey sought to assess medical students' viewpoints on AI, including their agreement levels regarding its influence on their future professional paths. Furthermore, it sought to gather insights into their comprehension of AI and evaluate their confidence in collaborating with AI in the forthcoming years. Through a series of questions, the survey also aimed to ascertain whether participants had received any formal education on AI and if such instruction was an obligatory component of their curriculum. SPSS21 software was used to perform the statistical analysis for this research[8].

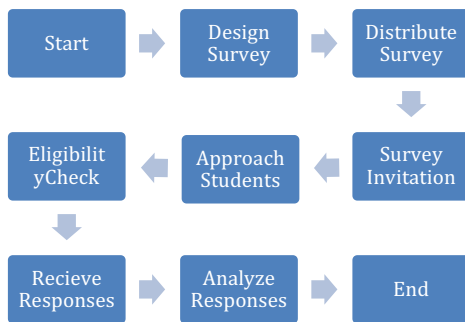


Figure 1. Flow the Research

The methodology used in this research can be summarized in the following steps:

1. Participant Selection and Invitation: Students enrolled in medical colleges in Iraq were

selected as the target population for this study. They were invited to participate in an online survey conducted through Google Forms.

2. Approach and Recruitment: The selected students were directly approached and encouraged to complete the survey via various social media platforms. Additional efforts were made to collaborate with medical colleges to ensure widespread distribution of the survey through online channels.
3. Eligibility Criteria: Only students possessing a valid email address from their respective medical colleges were considered eligible to partake in the survey. This criterion ensured that participants were actively enrolled in medical education programs.
4. Informed Consent and Anonymity: Prior to participating, students were duly notified that their responses would remain anonymous. This step was crucial to ensure the confidentiality and integrity of the data collected.
5. Survey Design: The survey's structure was meticulously designed by a team of AI experts and medical professionals with a keen interest in the field of AI. The survey comprised a total of 13 inquiries aimed at gauging medical students' perspectives on AI. These inquiries included questions regarding the students' level of agreement regarding AI's impact on their future careers, their comprehension of AI, and their confidence in collaborating with AI in the forthcoming years.
6. Data Collection: The survey was distributed online to the selected participants. Through a series of questions, the survey aimed to gather insights into the participants' perspectives and experiences related to AI in medical education.
7. Statistical Analysis: The collected data were analyzed using SPSS21 software. This

statistical analysis allowed for the examination of patterns, trends, and relationships within the data, providing valuable insights into the participants' responses and perspectives on AI in medical education.

8. Ethical Considerations: Throughout the study, ethical guidelines and principles were adhered to, ensuring the protection of participants' rights and confidentiality of their responses. Informed consent was obtained from all participants, and measures were implemented to safeguard their anonymity and privacy.
9. Limitations: It is important to acknowledge the limitations of the study, including potential biases inherent in self-reported survey data and the specific context of medical education in Iraq. These limitations should be considered when interpreting the findings of the study.

RESULT

In total, 318 responses were collected from students attending 22 medical colleges in Iraq. The vast majority of respondents (91.5%, $s = 291$) expressed the belief that AI will play a significant role in the country's healthcare system in the future. Specifically, 33.6% ($s = 107$) strongly agreed with this sentiment, while 57.9% ($s = 184$) agreed with it.

Furthermore, a majority of students (62.9%, $s = 200$) believed that certain medical specialties will be replaced by AI during their lifetime. This sentiment was expressed by both those who strongly agreed and those who simply agreed with the statement (28%, $s = 89$) disagreed or strongly disagreed with it. These findings are illustrated in Figure 2.

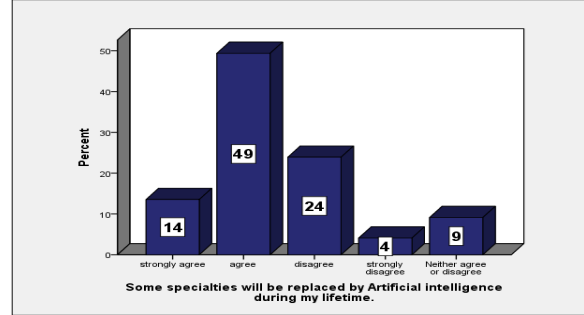


Figure 2. Students perspectives about specialties which will be replaced by AI.

A considerable number of respondents exhibited a deficiency in comprehending the fundamental computational principles that form the basis of AI when addressing inquiries related to the present understanding of AI. More precisely, merely 41.5% ($s = 132$) of the participants concurred or strongly concurred with this notion, whereas a slightly greater proportion of 43.4% ($s = 138$) expressed disagreement or strong disagreement. The remaining 15.1% ($s = 48$) adopted a neutral position on the subject matter.

In relation to the existing constraints of artificial intelligence (AI), a larger proportion of students asserted their possession of knowledge in this domain in comparison to those who lacked such understanding. Approximately 60.4% of the respondents agreed or strongly agreed with this statement, with 9.1% ($s = 29$) selecting strongly agree and 51.3% ($s = 163$) choosing agree. Conversely, 28.6% of the participants disagreed or strongly disagreed, comprising 2.5% ($s = 8$) and 26.1% ($s = 83$) respectively. The remaining 11% ($s = 35$) remained neutral in their response.

Furthermore, a higher percentage of students expressed discomfort with the terminology associated with AI, as opposed to those who felt otherwise. Specifically, 44.3% ($s = 141$) of the respondents disagreed or strongly disagreed with the nomenclature, while 41.8% ($s = 133$) agreed or strongly agreed, we can see in Figure. 3.

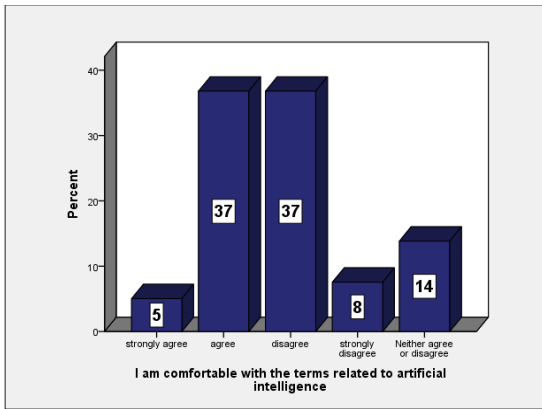


Figure 3. Students familiarity with AI terms

In relation to the inquiry, it was found that a significant majority of students (79.9%) believed that incorporating AI education in their curriculum would be advantageous for their future careers. Out of the total respondents, 32.4% (s = 103) strongly agreed while 47.5% (s = 151) agreed with the statement. A small percentage of students (7.5%, s = 24) remained neutral on the matter, while 10.1% (s = 32) disagreed. When inquired about the inclusion of AI training in their medical degree, a significant majority of students (79.9%, s = 254) responded affirmatively. Among them, 32.4% (s = 103) strongly agreed, while 47.5% (s = 151) simply agreed. Conversely, a mere 10.1% (s = 32) of students expressed disagreement, with an equal proportion of students (10.1%, s = 32) remaining neutral. Figure 4 visually represents these findings.

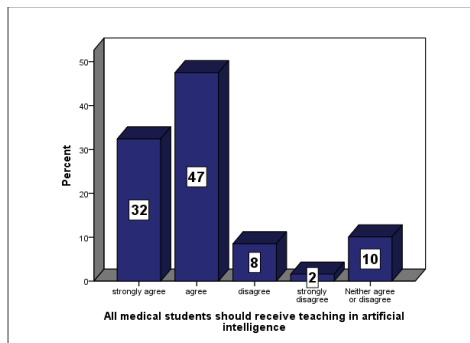


Figure 4. Students opinions about receiving AI Courses

Out of the 318 students surveyed, a mere 56 students (17.6% of the total) were fortunate enough to receive instruction on artificial intelligence (AI). It is noteworthy that 12.6% of these students were obliged to undertake AI education as a compulsory component of their curriculum. Encouragingly, over half of the students who had the opportunity to learn about AI found the instruction

to be beneficial, as indicated in Figure 5.

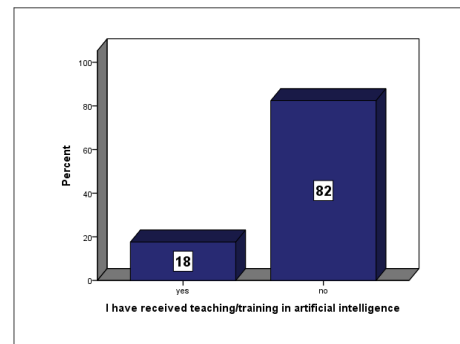


Figure 5. Students who received AI training

The readiness of students to engage with AI upon completion of their degree was found to be lacking, as indicated by the majority of respondents. Only a small proportion of students (14.5%, s = 46) expressed confidence in their ability to utilize AI tools if necessary. Conversely, a significant percentage (73.3%) of students acknowledged their possession of a fundamental comprehension of the techniques employed to evaluate AI performance. Furthermore, a slightly lower percentage (65.1%, s = 210) of students believed they possessed the requisite knowledge to effectively apply AI in routine clinical practice.

DISCUSSION

Computers have the capability to diagnose patients in medicine using two primary methods: flowcharts and the database approach. The flowchart-based technique involves converting the process of history taking, where a physician asks a series of questions and then combines the presented symptom complex to arrive at a probable diagnosis. This requires inputting a large amount of data into machine-based cloud networks, given the wide range of symptoms and disease processes encountered in routine medical practice. However, this approach's effectiveness is limited because machines cannot perceive and gather cues that only a doctor can discern during direct patient interaction. In contrast, the database approach utilizes the principle of deep learning or pattern recognition, wherein a computer is instructed to identify specific clusters of symptoms or particular clinical/radiological images through repetitive algorithms. A notable example of this

approach is Google's artificial brain project, which was initiated in 2012. Through autonomous training, this system analyzed 10 million YouTube videos to identify cats, continuously improving its performance as it processed a growing number of images. Impressively, within a short span of three days, it achieved a 75% accuracy rate in predicting images of cats [9, 10].

AI has emerged as a powerful tool for analyzing and identifying patterns in large and complex datasets, surpassing previous capabilities in terms of speed and precision [2]. This sentiment is widely shared among the majority of students in our research, with 91% acknowledging the significant role that AI will play in the field of healthcare. While there are convincing arguments against the complete replacement of healthcare professionals by AI, the combination of physicians and machines holds immense potential in enhancing clinical decision-making and improving patient health outcomes [11-13]. In our research, a considerable proportion (62.9%) of participants believed that certain medical specialties could be replaced by AI. However, it is important to note that AI cannot fully replace the art of care. Nevertheless, it is imperative for all medical students to receive education in artificial intelligence. As AI and its applications become increasingly prevalent in healthcare, medical students, residents, fellows, and practicing physicians must possess knowledge in AI, data sciences, as well as the ethical and legal considerations associated with AI. Consequently, medical colleges should incorporate these topics into their curriculum, adopting a staged approach to educate students throughout their academic journey.

Pinto dos Santos et al (2019) [14] identified a general lack of information among medical students regarding AI, with students primarily acquiring knowledge from mainstream media rather than university teaching. Therefore, our survey aimed to assess the level of understanding of AI and the state of relevant education among our medical students. We focused on three key areas deemed essential for grasping the fundamentals of AI: a basic understanding of AI principles, familiarity with associated terminology, and a basic comprehension of the current limitations of AI.

In our research, less than half of the students (44.3%) demonstrated a degree of understanding in these areas, which may explain the uncertainty surrounding the integration of AI into medical practice. Furthermore, only a small percentage (12.6%) of these students received AI education as part of their compulsory curriculum. Consequently, it remains unclear whether other students received similar instruction through intercalated degrees, student-selected modules, or other means.

Table 1. Comparison Questions

| No. of question | Question |
|-----------------|--|
| 1 | After graduation from medical college, I will be able to use AI basic tools in healthcare if required. |
| 2 | After graduation from medical college, My understanding of the assessment methodologies utilized to evaluate the performance of Artificial Intelligence algorithms in healthcare will be significantly improved. |
| 3 | After graduation from medical college, I am confident that I will acquire the necessary expertise to effectively utilize Artificial Intelligence in everyday clinical practice |

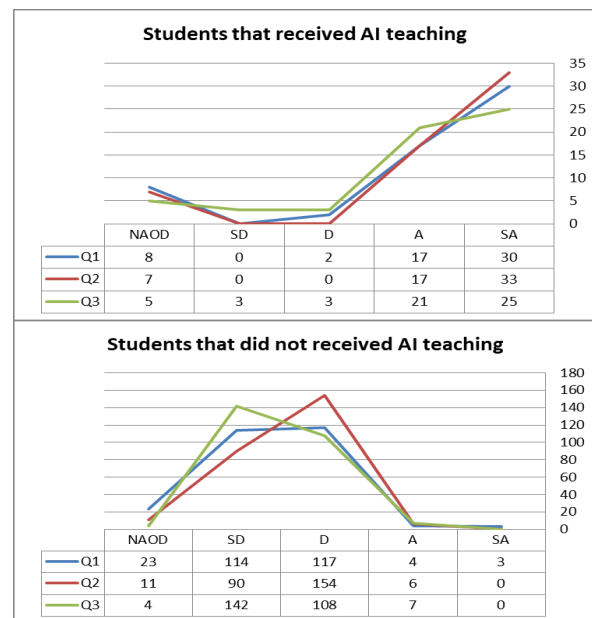


Figure 6. (A comparison between students who

have been exposed to AI education and those who have not received any instruction in AI, in terms of their perceived level of preparedness in effectively utilizing AI)

AI heavily relies on digital data, and thus, any inconsistencies in the availability and quality of data can significantly impede the potential of AI [15, 16]. In a recent research conducted by our research team, it was observed that a substantial proportion of students (60.4%) acknowledged this limitation [17]. Moreover, the findings from our research indicated that students who received instruction on this subject felt more equipped to effectively utilize AI tools compared to their counterparts who did not receive such training [17]. The future of AI in the healthcare sector holds immense possibilities, encompassing a wide range of tasks, varying from simple to complex [18]. These tasks may include answering phone calls, reviewing medical records, analyzing population health trends, designing therapeutic drugs and medical devices, interpreting radiology images, formulating clinical diagnoses and treatment plans, and even engaging in conversations with patients [18]. The integration of AI in healthcare has the potential to revolutionize patient care and improve overall healthcare outcomes [19].

CONCLUSION

It is important to note that machine learning is not intended to replace human physicians, but rather to assist and augment medical care. The implementation of AI in medicine is a complex journey that entails addressing various issues along the way. These include obtaining approvals from regulatory bodies such as the FDA, addressing ethical concerns related to data sharing, and dispelling misconceptions about AI among the general public. It is crucial to view AI as a decision support system in medicine, with the ultimate responsibility for actions resting with human healthcare professionals. The aim of this research was to explore the perspectives of medical students in Iraq regarding artificial intelligence (AI), including their understanding of AI and their career aspirations. Methodologically, a group of Iraqi medical students were invited to participate in an anonymous electronic survey. The collected data

were analyzed using SPSS21 software. The majority of respondents (91.5%, $s = 291$) hold the belief that AI will have a significant impact on healthcare in the future. This research reveals that Iraqi medical students recognize the significance of AI and are enthusiastic about engaging with this technology. Moreover, it suggests that there is a need to expand and enhance medical college training on AI to ensure that future healthcare professionals are well-prepared in this domain.

REFERENCES

- [1] M. Elahi, S. O. Afolaranmi, J. L. Martinez Lastra, and J. A. Perez Garcia, "A comprehensive literature review of the applications of AI techniques through the lifecycle of industrial equipment," *Discover Artificial Intelligence*, vol. 3, no. 1, p. 43, 2023.
- [2] A. C33-78, "Standard Specification for Concrete Aggregates 1," ed: ASTM International West Conshohocken, 2010.
- [3] A. M. Turing, *Computing machinery and intelligence*. Springer, 2009.
- [4] S. Banno, H. Murad, and M. Sallal, "Automated Cognitive Analyses for Intelligent Tutoring Systems," in *2020 IEEE/ACM International Conference on Big Data Computing, Applications and Technologies (BDCAT)*, 2020: IEEE, pp. 171-178.
- [5] P. Malik, M. Pathania, and V. K. Rathaur, "Overview of artificial intelligence in medicine," *Journal of family medicine and primary care*, vol. 8, no. 7, pp. 2328-2331, 2019.
- [6] P. Hamet and J. Tremblay, "Artificial intelligence in medicine," *Metabolism*, vol. 69, pp. S36-S40, 2017.
- [7] O. Asan, A. E. Bayrak, and A. Choudhury, "Artificial intelligence and human trust in healthcare: focus on clinicians," *Journal of medical Internet research*, vol. 22, no. 6, p. e15154, 2020.
- [8] C. Ibm, "IBM SPSS statistics for Windows," *Armonk (NY): IBM Corp*. 2012.
- [9] L. Clark, "Google's artificial brain learns to find cat videos," *Wired UK*, www.wired.com, 2012.
- [10] J. Markoff, "How many computers to identify a cat? 16,000," *New York Times*, vol. 26, 2012.

- [11] M. K. Leung, A. DeLong, B. Alipanahi, and B. J. Frey, "Machine learning in genomic medicine: a review of computational problems and data sets," *Proceedings of the IEEE*, vol. 104, no. 1, pp. 176-197, 2015.
- [12] A. M. Association, "AMA passes first policy recommendations on augmented intelligence. 2018," *Accessed at www. ama-assn. org/ama-passes-first-policy-recommendations-augmented-intelligence on*, vol. 6, 2018.
- [13] K. Paranjape, M. Schinkel, R. N. Panday, J. Car, and P. Nanayakkara, "Introducing artificial intelligence training in medical education," *JMIR medical education*, vol. 5, no. 2, p. e16048, 2019.
- [14] D. Pinto dos Santos *et al.*, "Medical students' attitude towards artificial intelligence: a multicentre survey," *European radiology*, vol. 29, pp. 1640-1646, 2019.
- [15] S. Artificial Intelligence, "AI in the UK: ready, willing and able," *UK House of Lords*, 2018.
- [16] M. P. Recht *et al.*, "Integrating artificial intelligence into the clinical practice of radiology: challenges and recommendations," *European radiology*, vol. 30, pp. 3576-3584, 2020.
- [17] L. Chen, P. Chen, and Z. Lin, "Artificial intelligence in education: A review," *Ieee Access*, vol. 8, pp. 75264-75278, 2020.
- [18] J. Bajwa, U. Munir, A. Nori, and B. Williams, "Artificial intelligence in healthcare: transforming the practice of medicine," *Future healthcare journal*, vol. 8, no. 2, p. e188, 2021.
- [19] A. Harry, "The future of medicine: harnessing the power of AI for revolutionizing healthcare," *International Journal of Multidisciplinary Sciences and Arts*, vol. 2, no. 1, pp. 36-47, 2023.

Conflict of Interest Statement:

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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