ARTIFICIAL INTELLIGENCE ETHICS AND HEALTHCARE

Amer Abu-Jassar[1], Ehab Zuhair Al-Jamal[2]

[1]Faculty of Information Technology, Department of Computer Science Ajloun National University, Ajloun, Jordan

[2]Cybersecurity Department, Ajloun National University, Ajloun, Jordan

Abstract: Artificial intelligence (AI), known by some as the industrial revolution (IR) 4.0, is going to change not only the way we do things, how we relate to others, but also what we know about ourselves. The IR1.0, the IR of the 18th century, impelled a huge social change without directly complicating human relationships. Modern AI, however, has a tremendous impact on how we do things and also the ways we relate to one another. Facing this challenge, new principles of AI bioethics must be considered and developed to provide guidelines for the AI technology to observe so that the world will be benefited by the progress of this new intelligence, in particular for healthcare.

Key words: Artificial Intelligence, Healthcare, Ethics, Clinical Practice, Data Privacy, AI Challenges.

Introduction

Artificial intelligence (AI) has many different definitions [1]. Some see it as the created technology that allows computers and machines to function intelligently. Some see it as the machine that replaces human labor to work for men a more effective and speedier result. Others see it as "a system" with the ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation.

Despite the different definitions, the common understanding of AI is that it is associated with machines and computers to help humankind solve problems and facilitate working processes.

Therefore, AI is used in all areas of human activity. AI ideas are applied to solve various practical problems [2]-[10]. In this case, you can use various approaches and algorithms that have found wide application in other areas of research [11]-[16]. Ultimately, these determine the relevance of this study, its importance in practical and scientific aspects.

Related works

There are many works devoted to the ethics of AI, which examine various areas of research on this issue.

T. Hagendorff evaluates AI guidelines by comparing mind and machine [17]. The author emphasizes that it was the development of AI that led to heated discussion and

debate on the ethics of AI. Therefore, first of all, it is important to consider the guiding principles of such a problem. Here, attention should be paid to the developments and applications of AI systems and how AI ethics requirements can be made more effective [17].

Study [18] provides a review on the ethics of artificial intelligence in healthcare. The authors provide some summary of the debate and identify open questions for future research in AI. For this purpose, 156 articles were analyzed. This revealed various AI ethics issues. The main conclusion of such research is the fact that unless quick action is taken, a new "AI winter" may occur due to the chilling effects associated with the loss of public confidence in the benefits of AI for healthcare [18].

K. Siau and W. Wang also analyze various problematic aspects of AI [19]. The authors emphasize that low explainability, data bias, data security, data privacy, and ethical issues of AI-based technologies pose significant risks to users, developers, humanity, and society [19]. This is despite the fact that advances in AI are impressive. The authors also explain the object of their study based on the fact that AI ethics is the study of ethical principles, rules, guidelines, policies and regulations related to AI.

J. C. Heilinger reviews and analyzes constructive criticism of AI ethics [20]. The author identifies conceptual, substantive, and procedural issues in AI ethics. A solution to such issues is also proposed. Moreover, such a solution includes the aspect that AI truly improves human lives and the development of society.

A. Jobin, M. Ienca, and E. Vayena study global principles of AI ethics [21]. The authors note the fact that it is necessary to understand what ethical requirements, technical standards and best practices are necessary to implement AI for the benefit of humans.

However, despite this variety of research areas, the ethics of AI in terms of its use in healthcare is of particular interest. But before that, we'll also look at the general ethical issues of AI.

Ethical Issues and Risks of AI

To address the ethical problems of AI, we must first recognize and understand the potential ethical issues or risks that AI may bring. Then, the necessary AI ethical guidelines, policies, principles, rules (i.e., Ethics of AI) can be formulated appropriately. With the adequate ethics of AI, we can design and build AI that behaves ethically (i.e., Ethical AI). The ethical issue of AI generally refers to the morally bad things or problematic outcomes relevant to AI (i.e., these issues and risks that are raised by the development, deployment, and use of AI) that need to be addressed [22]. Many ethical issues, such as lack of transparency, privacy and accountability, bias and discrimination, safety and security problems, the potential for criminal and malicious use, and so on, have been identified from the applications and studies (Fig. 1).
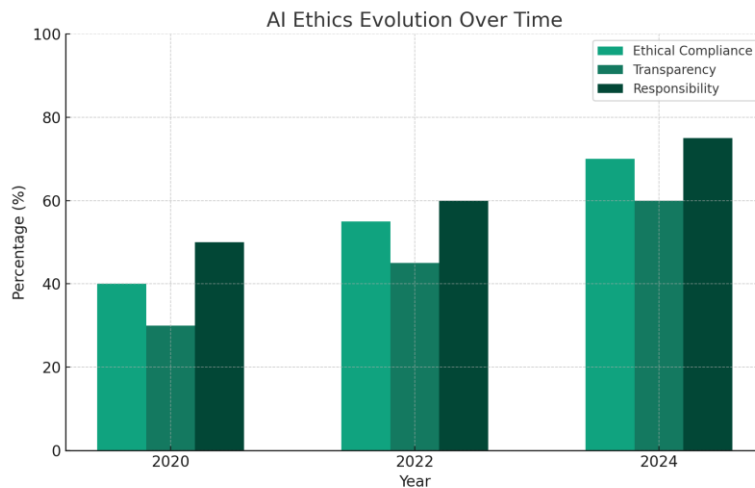
Figure 1: AI ethics evolution over time

In addition to the aspects previously discussed, it is crucial to delve deeper into the impact of Artificial Intelligence (AI) on human relationships and the corresponding ethical considerations. Modern AI profoundly affects not only our industrial and economic activities but also the way we interact with one another, raising new ethical challenges about privacy, bias, and manipulation.

AI influences more than just our industrial and economic actions; it significantly alters how we relate to each other, bringing to the fore ethical issues surrounding privacy, bias, and the potential for manipulation.

In the era of AI, privacy and surveillance issues become more complex due to the increased capability of technology to collect and analyze personal data (Fig. 2) [23].

Exploring how AI may reinforce existing biases and the challenges associated with understanding decision-making processes within these systems is imperative.
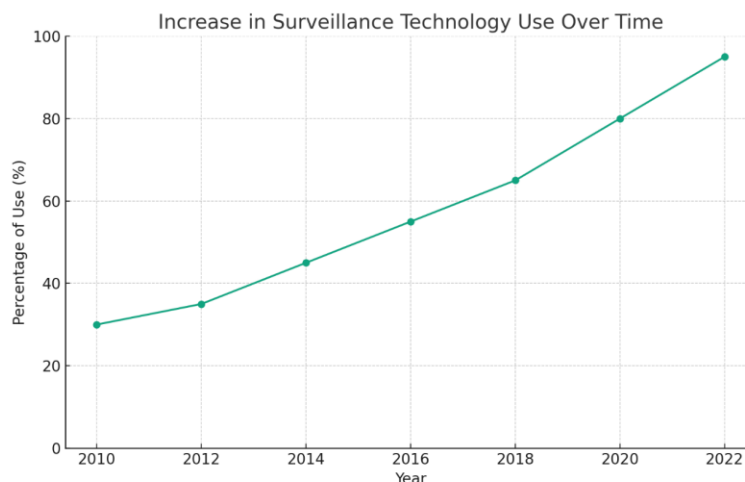
Figure 2: Increase in surveillance technology use over time

It is important to address philosophical questions such as "Should robots be granted rights?" And "How can responsibility be determined within AI systems?"

Future Best Practices for Ethical AI Systems

The research paper "Ethics of AI: A systematic literature review of principles and challenges" lays the groundwork for proposing a maturity model to assess the ethical capabilities of AI systems. This model is crucial for guiding future enhancements in the field of AI ethics. Here are some of the proposed best practices for future improvements [24]:

Comprehensive Ethical Assessments: The maturity model suggests that AI systems should undergo thorough ethical evaluations, examining aspects such as transparency, fairness, privacy, and accountability. This comprehensive assessment ensures that AI systems align with established ethical standards.

Continuous Improvement and Monitoring: AI technologies are dynamic, necessitating ongoing monitoring and continuous improvements to maintain ethical standards. This involves regular updates to the system in response to new ethical challenges and societal expectations.

Stakeholder Involvement: Involving various stakeholders, including ethicists, users, and regulatory bodies, in the development and evaluation process is vital. Their diverse perspectives can contribute to a more holistic and culturally sensitive approach to AI ethics.

Transparency in Decision-Making Processes: Ensuring that AI systems are transparent in their decision-making processes helps in building trust and understanding among users and stakeholders. This transparency also facilitates easier identification and correction of biases or errors.

Ethical Training for AI Practitioners: Providing comprehensive ethical training for AI developers and practitioners is essential. This training should cover the potential ethical implications of AI systems and ways to mitigate risks.

Legal and Regulatory Compliance: AI systems must adhere to existing legal and regulatory frameworks. Staying updated with evolving laws and regulations related to AI ethics is crucial for compliance and societal acceptance.

Artificial Intelligence in Healthcare

Artificial Intelligence (AI) is increasingly pivotal in healthcare, offering groundbreaking prospects for enhancing patient outcomes and healthcare delivery. This section delves into how AI is reshaping healthcare, from early and accurate disease diagnosis to the personalization of treatment plans.

AI's integration into healthcare enables the analysis of vast datasets, facilitating early disease detection and customized treatment strategies. Moreover, AI applications in medical imaging, such as analyzing X-rays or MRI scans, are significantly improving diagnostic accuracy.

However, the implementation of AI in healthcare is not without challenges. Key concerns include ensuring data privacy, addressing potential biases in AI algorithms, and maintaining the indispensable human element in healthcare decision-making.

The responsible integration of AI in healthcare promises to enhance patient care, streamline clinical workflows, and foster a more efficient healthcare system. This paradigm shift necessitates careful navigation of both technological potential and ethical considerations to realize the full benefits of AI in healthcare (Fig. 3) [25].
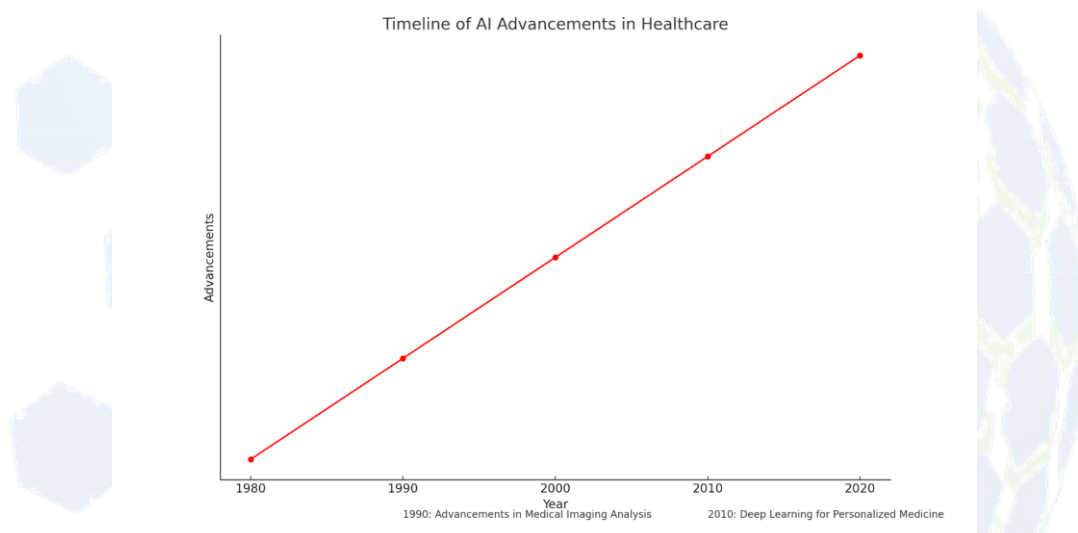

Figure 3: Timeline of AI advancement in healthcare

In analyzing the article "Revolutionizing healthcare: the role of artificial intelligence in clinical practice," we observe a nuanced depiction of AI's transformative role in healthcare. The article commendably highlights AI's potential in enhancing disease diagnosis, treatment, and patient engagement, illustrating a progressive shift towards more efficient healthcare systems.

Positives: The article effectively underscores the significant benefits of AI in healthcare, particularly in improving diagnostic accuracy and treatment personalization.

Negatives: While AI's benefits are clear, the article suggests a need for caution, especially regarding data privacy and algorithmic bias, which are critical concerns in patient care.

Gaps: The discussion lacks specific insights into AI's role in countering cybersecurity threats within healthcare, an area of growing importance.

Suggestions: Future research should focus on developing ethical frameworks and regulatory policies for AI in healthcare, ensuring a balanced approach between technological advancements and ethical considerations.

Optimal Approaches: Emphasizing AI development that promotes human-AI collaboration, with a strong focus on enhancing data security and privacy, could be a strategic way forward, addressing both healthcare improvement and cybersecurity concerns.

Conclusion

As AI continues to advance, it is imperative to navigate its ethical landscape diligently. While AI offers numerous benefits, it also presents challenges that require careful consideration and proactive solutions. By addressing these challenges head-on and recognizing the potential pitfalls, we can harness AI's power for the greater good, ensuring it serves humanity's best interest.

References:

1. Helm, J. M., & et al.. (2020). Machine learning and artificial intelligence: definitions, applications, and future directions. Current reviews in musculoskeletal medicine, 13, 69-76.

2. Holzinger, A., Langs, G., Denk, H., Zatloukal, K., & Müller, H. (2019). Causability and explainability of artificial intelligence in medicine. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 9(4), e1312.

3. Marr, B. (2019). Artificial intelligence in practice: how 50 successful companies used AI and machine learning to solve problems. John Wiley & Sons.

4. Matarneh, R., & et al.. (2017). Building robot voice control training methodology using artificial neural net. International Journal of Civil Engineering and Technology, 8(10), 523-532.

5. Lyashenko, V., & et al.. (2021). Wavelet ideology as a universal tool for data processing and analysis: some application examples. International Journal of Academic Information Systems Research (IJAISR), 5(9), 25-30.

6. Rabotiahov, A., Kobylin, O., Dudar, Z., & Lyashenko, V. (2018, February). Bionic image segmentation of cytology samples method. In 2018 14th International Conference on Advanced Trends in Radioelecrtronics, Telecommunications and Computer Engineering (TCSET) (pp. 665-670). IEEE.

7. Lyashenko, V. V., Babker, A. M. A. A., & Kobylin, O. A. (2016). The methodology of wavelet analysis as a tool for cytology preparations image processing. Cukurova Medical Journal, 41(3), 453-463.

8. Kuzemin, A., & et al.. (2011). Microsituation Concept in GMES Decision Support Systems. In Intelligent Data Processing in Global Monitoring for Environment and Security, 217–238.

9.   Al-Sharo, Y. M., Abu-Jassar, A. T., Sotnik, S., & Lyashenko, V. (2021). Neural Networks As A Tool For Pattern Recognition of Fasteners. International Journal of Engineering Trends and Technology, 69(10), 151-160.

10.   Orobinskyi, P., Petrenko, D., & Lyashenko, V. (2019, February). Novel Approach to Computer-Aided Detection of Lung Nodules of Difficult Location with Use of Multifactorial Models and Deep Neural Networks. In 2019 IEEE 15th International Conference on the Experience of Designing and Application of CAD Systems (CADSM) (pp. 1-5). IEEE.

11.   Lyubchenko, V., & et al.. (2016). Digital image processing techniques for detection and diagnosis of fish diseases. International Journal of Advanced Research in Computer Science and Software Engineering, 6(7), 79-83.

12.   Sotnik, S., Mustafa, S. K., Ahmad, M. A., Lyashenko, V., & Zeleniy, O. (2020). Some features of route planning as the basis in a mobile robot. International Journal of Emerging Trends in Engineering Research, 8(5), 2074-2079.

13.   Nevliudov, I., & et al.. (2020). Method of Algorithms for Cyber-Physical Production Systems Functioning Synthesis. International Journal of Emerging Trends in Engineering Research, 8(10), 7465-7473.

14.   Lyashenko, V., Sotnik, S., & Manakov, V. (2021). Modern CAD/CAM/CAE Systems: Brief Overview. International Journal of Engineering and Information Systems (IJEAIS), 5(11), 32-40.

15.   Sotnik S. Overview of Modern Accelerometers // International Journal of Engineering and Information Systems (IJEAIS) / S. Sotnik, V. Lyashenko. – 2022. – Vol. 6, Issue 1. – pp. 57-64.

16.   Ahmad, M. A., Lyashenko, V. V., Deineko, Z. V., Baker, J. H., & Ahmad, S. (2017). Study of Wavelet Methodology and Chaotic Behavior of Produced Particles in Different Phase Spaces of Relativistic Heavy Ion Collisions. Journal of Applied Mathematics and Physics, 5, 1130-1149.

17.   Hagendorff, T. (2020). The ethics of AI ethics: An evaluation of guidelines. Minds and machines, 30(1), 99-120.

18.   Morley, J., Machado, C. C., Burr, C., Cowls, J., Joshi, I., Taddeo, M., & Floridi, L. (2020). The ethics of AI in health care: a mapping review. Social Science & Medicine, 260, 113172.

19.   Siau, K., & Wang, W. (2020). Artificial intelligence (AI) ethics: ethics of AI and ethical AI. Journal of Database Management (JDM), 31(2), 74-87.

20.   Heilinger, J. C. (2022). The ethics of AI ethics. A constructive critique. Philosophy & Technology, 35(3), 61.

21.   Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. Nature machine intelligence, 1(9), 389-399.

22. Müller, V. C. (2020). Ethics of Artificial Intelligence and Robotics. In E. N. Zalta (Ed.), Stanford Encyclopedia of Philosophy. Palo Alto, CA: CSLI, Stanford University.

23. Bertoncini, A. L. C., & Serafim, M. C. (2023). Ethical content in artificial intelligence systems: A demand explained in three critical points. Frontiers in Psychology, 14, 1074787.

24. Khan, A. A., Badshah, S., Liang, P., Khan, B., Waseem, M., Niazi, M., & Akbar, M. A. (2020). Ethics of AI: A systematic literature review of principles and challenges. arXiv preprint arXiv:2109.07906.

25. Alowais, S.A., Alghamdi, S.S., Alsuhebany, N. et al. (2023). Revolutionizing healthcare: the role of artificial intelligence in clinical practice. BMC Medical Education, 23, 689.