The Role of Artificial Intelligence in the Future of Work

May 24, 2021 by Jay Vietas, PhD, CIH, CSP

As discussed in a previous NIOSH Science Blog, artificial intelligence (AI) is in the process of transforming almost all aspects of society. Whether using an application to determine the best route to drive, receiving recommendations from Netflix on what to watch, or using face detection to logon to a personal smartphone, the use of AI is already very much part of modern living.

Specific to the workplace, work, and workforce, AI is fueling improvements in productivity and will likely be a significant influencer on the future of work. Whether using natural language processing to extract valuable information from volumes of reports [1], using models to predict supply needs [2], or using computer vision to recognize outputs or products [3-4], these tools are quickly becoming essential ingredients to developing a competitive edge in business today.

Although research gaps exist regarding the use and impact of AI on the workforce, AI offers both the promise to improve the safety and health of workers, and the possibility of placing workers at risk in both traditional and non-traditional ways. Occupational safety and health (OSH) professionals and practitioners, typically focused on specific physical, chemical, and biological hazards in the workplace, should be aware of the implications AI might have for the workforce.

In worker safety and health, AI offers the ability to take advantage of advances in sensors within the work environment [5-6]. The large data sets generated by these sensors can be used to improve exposure estimates and potentially predict adverse events in the workplace. Computers can be trained to learn patterns in images or video, enabling a form of AI described as computer vision. Computer vision has been shown to be useful in monitoring safety compliance [7-8], tracking workers in a particular area [9], and examining safety conditions on a particular job site [10]. Computer vision can also be layered over physical reality. Referred to as augmented reality, it can provide information to workers and OSH professionals, which can improve training and assist in reducing the impact of hazards in the workplace [11]. Computers can also be trained to process and analyze human language, also called natural language processing; such a tool has provided valuable information regarding fatality data in the mining industry [12], and could offer additional opportunities through the review of safety reports for OSH and allied professionals in the field.

In addition to the benefits of AI, there are also concerns regarding the use of this technology in the workplace. This is especially true if the data used are incomplete, inappropriate, or insecure; the methods are not easily explained or understood; or if the systems operate without the oversight of a human agent [13-14]. Integration of this technology, using systems which are predictable and reliable, has been shown to improve performance and acceptance [15]. The inverse also appears to be true, demonstrated by failures associated with the Maneuvering Characteristic Augmentation System (MCAS), an AI system designed to activate and assist the pilot under particular circumstances, which resulted in the two crashes of Boeing 737 Max airplanes [16-17].

To illustrate further, a preliminary report from the National Transportation Safety Board stated that a lack of information necessary to identify non-normal conditions, limited assumptions regarding pilot response, and transparent understanding of the operation of the MCAS contributed to both of these incidents [18]. Safety Board recommendations, which may be applicable for most AI systems, include the development of tools and methods to validate assumptions about pilot or operator recognition and response, consideration of the design and training to minimize the potential for safety impact, and improvement in the clarity of failure indicators to enhance timeliness and effectiveness of response of the pilot.

Simply put, there is a need to consider human interaction and response when implementing technological solutions. OSH professionals and practitioners should consider how the worker will interact with the tool; the decisions which may be made which encourage human action (or inaction); position(s) the worker must maintain; and the impact on schedules, number of hours worked, or even the potential to work alone. These possibilities should be evaluated to determine how they impact chemical, physical, and biological hazard exposures in the workplace, how they impact the mental health and well-being of the workforce, and if they generate new or unanticipated potential hazards.

In an attempt to promote human dignity, while minimizing potential risk, a variety of organizations developed recommendations for the responsible and ethical use of AI in society [19-21]. Such recommendations can help OSH

professionals and practitioners engage with data scientists and computer programmers to develop AI systems applicable to the workforce, which are effective, explainable, accountable, secure, and fair.

- **Effective:** *Ensure AI is the right tool to address the problem/concern.* Technology should be used to improve productivity or working conditions and should not be used haphazardly. While the improper use of a particular AI system may not directly cause harm, it may ultimately impact trust in other AI-based systems.
- **Explainable:** *Logic of, and decisions produced by AI should be communicated to stakeholders in a concise and useful manner*. This is essential for mitigating risk and assessing impact of unintended, and potentially harmful, consequences.
- **Accountable:** *Organizations and individuals should be accountable for the outcomes of the AI systems they develop and implement.* For data scientists and computer programmers, accountability encourages an attached understanding of the systems created and the potential impact on others. Furthermore, if unexpected or safety incidents occur, the appropriate group or individuals can learn and improve from the incident.
- **Secure:** *AI systems should be safe from outside interference.* While cybersecurity is typically familiar for programmers, the potential consequence if the system is hacked or the data become corrupt should be an important safety consideration. Access to the data and the code used for the system should be known and based upon appropriate risk-benefit analysis. OSH professionals and practitioners should consider or lead these analyses.
- **Fair:** *AI systems should be aware of and appropriately address potential discrimination and bias*. Systems, which are trained using one segment of the population may be biased and produce results which are different for another portion of the population. Evaluating and testing systems which guard against this premise can ensure safer outcomes and improve worker acceptance.

The possible uses of AI within the workplace are numerous and are expected to be a primary driver in defining the future of work. While the benefits are expected to be tremendous, the potential risks to worker health will continue to evolve along with the advances in technology. NIOSH will continue to research how AI may be able to assist the OSH community, advancing understanding of the origins of how AI may cause adverse health outcomes, and also improving the practical application of worker safety and health risk management in an increasingly AI-inhabited world.

Would you like to learn more about the impact of AI on tomorrow's workforce? Join us on Thursday, June 17, 2021 from 1pm-2pm EDT for: *The Role of Artificial Intelligence in the Future of Work.* This free webinar, presented by the NIOSH Future of Work Initiative, Emerging Technologies Branch, and Artificial Intelligence Interest Group will feature Dr. Jay Vietas from NIOSH and Dr. Houshang Darabi from the University of Illinois-Chicago.

The Role of Artificial Intelligence in the Future of Work webinar is now available online.

Have you used AI in your workplace? We would like to hear about your experiences in the comment section below.

To learn more about the NIOSH Future of Work Initiative, please visit the NIOSH Future of Work Initiative website.

Jay Vietas, PhD, CIH, CSP, is Branch Chief of the Emerging Technologies Branch in the NIOSH Division of Science Integration.

References

1. Zhang F, Fleyeh H, Wang X, Lu M [2019]. Construction site accident analysis using text mining and natural language processing techniques. Autom Constr, Vol. 99, pp. 238-248.
2. Tilimbe J [2019]. Ethical implications of predictive risk intelligence. The ORBIT Journal, Vol. 2, No. 2, 2019/01/01/, pp. 1-28.
3. Santra B, Shaw AK, Mukherjee DP [2021]. An end-to-end annotation-free machine vision system for detection of products on the rack. Mach Vision Appl, Vol. 32, No. 3.
4. Zhou H, Zhuang Z, Liu Y, Liu Y, Zhang X [2020]. Defect classification of green plums based on deep learning. Sensors, Vol. 20, No. 23, pp. 1-15.
5. Abtahi F, Forsman M, Diaz-Olivazrez JA, Yang L, Lu K, Eklund J, Lindecrantz K, Seoane F, Teriö H, Mediavilla Martinez C, Aso

S, Tiemann C [2017]. Big data & wearable sensors ensuring safety and health @work. In: GLOBAL HEALTH 2017, The Sixth International Conference on Global Health Challenges.2017).

6. Kalasin S, Sangnuang P, Surareungchai W [2021]. Satellite-based sensor for environmental heat-stress sweat creatinine monitoring: The remote artificial intelligence-assisted epidermal wearable sensing for health evaluation. ACS Biomater Sci Eng, Vol. 7, No. 1, Jan 11, pp. 322-334.
7. Dong S, Li H, Yin Q [2018]. Building information modeling in combination with real time location systems and sensors for safety performance enhancement. Safety Science, Vol. 102, 2018/02/01/, pp. 226-237.
8. Wei L, Cheng M, Feng M, Lijuan Z [2020]. Research on recognition of safety helmet wearing of electric power construction personnel based on artificial intelligence technology. Journal of Physics: Conference Series, Vol. 1684, 2020/11, p. 012013.
9. Kochovski P, Stankovski V [2021]. Building applications for smart and safe construction with the decenter fog computing and brokerage platform. Autom Constr, Vol. 124, 2021/04/01/, p. 103562.
10. Xu Z, Saleh JH [2021]. Machine learning for reliability engineering and safety applications: Review of current status and future opportunities. Reliab Eng Syst Saf, Vol. 211.
11. Mizuno Y, Kato H, Nishida S [2004]. Outdoor augmented reality for direct display of hazard information. In: 1, SICE 2004 Annual Conference.4-6 Aug. 2004), 831-836 vol. 831 pp.
12. Raj KV, Tarshizi EK [2020]. Advanced application of text analytics in msha metal and nonmetal fatality reports. In:Society for Mining, Metallurgy and Exploration.
13. Liu HW, Lin CF, Chen YJ [2019]. Beyond state v loomis: Artificial intelligence, government algorithmization and accountability. Int. J. Law Inf. Technol., Vol. 27, No. 2, pp. 122-141.
14. Schneier B [2021]. Hackers used to be humans. Soon, ais will hack humanity. Wired, 29 April 2021.
15. Daronnat S, Azzopardi L, Halvey M, Dubiel M [2020]. Impact of agent reliability and predictability on trust in real time human-agent collaboration. In:Association for Computing Machinery, Inc, 131-139 pp.
16. Ahmed HO, Norimitsu; Searcey, Dionne; Beech, Hannah [2019]. Ethiopian airlines plane is the 2nd boeing max 8 to crash in months. New York Times, 10 March 2109.
17. Suhartono MR, Austin [2019]. Indonesian report on lion air crash finds numerous problems. New York Times, 25 October 2019.
18. National Transportation Safety Board [2019]. Assumptions used in the safety assessment process and the effects of multiple alerts and indications on pilot performance accident number: Dca19ra017 / dca19ra101. 19 September 2019, Washington, D.C., National Transportation Safety Board, 13 pp.
19. Floridi L, Cowls J, Beltrametti M, Chatila R, Chazerand P, Dignum V, Luetge C, Madelin R, Pagallo U, Rossi F, Schafer B, Valcke P, Vayena E [2018]. Ai4people—an ethical framework for a good ai society: Opportunities, risks, principles, and recommendations. Minds and Machines, Vol. 28, No. 4, 2018/12/01, pp. 689-707.
20. European Commission [2020]. On artificial intelligence – a european approach to excellence and trust. 19 February 2020, 26 pp.
21. 1783 Azoulay A [2021]. Towards an ethics of artificial intelligence, United Nations.

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now days Artificial Intelligence is part of our daily life. these technics we were using daily and even face recognition are helpful for authenticate person to login.
dont know this technology where will took the man.
thank you for nicest blog and every person can understood what actually AI.
Reply

It is a really nice post, you describe it perfectly. Artificial intelligence is a reality of today's world and it's a part of almost every field of the life.
Reply

Incredible job here. and thank you for allowing us to witness the experiences and thoughts and work. keep up the great work. stay well.
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AI is definitely becomeing more and more part of every day work life.
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