Advantages and Challenges of Using AI for People with Disabilities

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Abstract: This paper discusses the usage of AI in health informatics and its benefits and challenges for people with disabilities. While AI can assist in tracing pandemics, predicting disease onset, and advocating for human rights, it can also perpetuate biases towards different groups, including people with disabilities. A systematic scoping review was conducted to explore the interplay between disability and AI. We examined 45 articles from eight online databases and highlighted the potential of AI in enhancing healthcare. However, it also revealed a high prevalence of a narrow medical model of disability and an ableist perspective in AI research, emphasizing the need for more inclusive AI systems. Using AI has the potential to benefit all members of society equitably. The findings suggest that AI has great potential for transforming healthcare. However, there is a need to conduct more research in this area, particularly in relation to AI bias, inclusive design, and considering social factors.

1 INTRODUCTION

The CRPD, or Convention on the Rights of Persons with Disabilities, defines disability as a dynamic concept. This concept results from the interaction between impaired individuals and social or environmental obstacles. These obstacles prevent them from fully participating in society. This is referred to as the "social model" of disability.

It is essential to understand the impact of AI on people with disabilities, as AI software uses existing data to make predictions. However, there needs to be more published reviews on this topic. To address this gap, a scoping review has been conducted to provide an overview of the current knowledge on the benefits of AI for people with disabilities.

2 METHODS

We utilized eight online databases for this scoping review, including ProQuest, IEEE Xplore, ACM Digital Library, Web of Science, Medline, PubMed, PsycINFO, and CINAHL. With the guidance of my supervisor, I established a set of key search terms to conduct the literature search strategy. The search terms included people with disabilities, disabilities, disability, disabled, disable, artificial intelligence, AI, A.I., and machine learning. Out of the 354 citations extracted, 84 articles were unique.

To conduct this scoping review on the topic of AI and machine learning and people with disabilities, certain inclusion and exclusion criteria were established. The inclusion criteria specified that studies published in the last five years in the form of

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journal articles or conference papers would be considered. Studies not written in English or not scholarly publications were excluded. Due to the nature of the systematic scoping review, the search was limited to the titles of the journal articles. The most recent search was conducted on February 17, 2023.

During the research, 84 abstracts were screened based on the inclusion and exclusion criteria. Both FM and BK, the two authors, used Rayyan software to review the 84 articles, and they identified 64 articles as potentially eligible. Subsequently, both authors reviewed the full-text version of the 64 articles retrieved for review and synthesis, as shown in Figure 1. FM was responsible for conducting the literature search and collecting the articles, while FM and BK collected data from the articles and conducted the literature review. CE, another author, repeated the process to ensure accuracy. In case of ambiguities or disagreements, a discussion was held to decide whether to include or exclude.

The studies were restricted to scholarly publications, such as journal articles and conference papers published in the last five years and focused on AI or machine learning and individuals with disabilities. The most recent search was conducted on February 17, 2023.

Out of the 84 articles, 45 were kept for analysis. We are reporting here an interim analysis of 34 articles related to addressing the advantages of AI for people with disabilities.

3 RESULTS

Out of the total number of studies, 16 were focused on adults, while 7 were centered on children and 3 on the elderly population. Only 1 of the studies had both children and adult participants, and 7 didn't provide any information about the age groups they studied.

Twenty-three studies had a medical perspective, while eleven looked at disability from a formal social model perspective.

Out of all the studies reviewed, 14 were conducted in a clinical setting, 8 used pre-existing datasets, 5 were focused on educational settings, 5 were carried out in a laboratory setting, and only 1 targeted home setting. Additionally, 1 study did not require or specify a particular setting.

3.1 Advantages

3.1.1 Self-Management of Health

According to our analysis, the use of AI technology has been observed in 24 studies for self-management of health, including diagnosis, disability risk assessment, disability progression, and rehabilitation risk factors (Alves et al., 2022; De Brouwer et al., 2021; Erbeli et al., 2023; Flauzino et al., 2019; Fuh-Ngwa et al., 2022; Hori et al., 2021; Islam et al., 2018; Koc et al., 2021; Law et al., 2019; Modak et al., 2020; Montolio et al., 2022; Montolio et al., 2021; Mostafa et al., 2021; Nikam et al., 2019; Rehak Buckova et al., 2023; Roca et al., 2020; Song et al., 2022; Tommasin et al., 2021; Wolff et al., 2022; Xiang et al., 2023; Yang & Bai, 2022; Youssef & Youssef, 2019; Yperman et al., 2020; Zivadinov et al., 2022).

The debilitating conditions that were covered included multiple sclerosis, developmental disorders, dyslexia, and autism.

3.1.2 Assistive Technologies

There was a total of six studies that focused on the application of AI in assistive technologies (Blanc et al., 2019; Encinas Cantaro & Montano Isabel, 2020; Ghazal et al., 2021; Herbuela et al., 2022; Tamilselvan et al., 2020; Tanabe et al., 2023). Three the six studies were related to assistive communication, while the remaining three were related to mobility.

3.1.3 Disability Justice

Out of all the articles on AI, only four focused on disability justice (El Morr et al., 2021; Gorman et al., 2021; Sobnath et al., 2020; Terziyan & Kaikova, 2021). Among these, one was related to the development of AI specifically designed for people with disabilities, while the remaining three were centered on social justice concerns. The use of AI techniques has facilitated semi-automatic content tagging and intelligent semantic searches. This has been a great help for people with disabilities and disability advocacy organizations to access trusted sources of information (El Morr et al., 2021; Gorman et al., 2021). There are challenges that advocacy groups often face with monitoring human rights and identifying systemic discrimination against disabled people because of the lack of disability data, but ML approaches provided a solution.

3.2 Challenges

3.2.1 Ethical and Legal

While cutting-edge technologies like AI bring advancements, they also pose challenges such as privacy concerns and biases. Legal frameworks can help address privacy and cyber-security issues posed by wireless communication devices (Fichten et al., 2022).

However, the high costs of AI-based tools could worsen economic disparities, especially for people with disabilities. Anticipating and incorporating ethical solutions into the design of assistive technologies can help mitigate these challenges (Zdravkova et al., 2022).

3.2.2 Non-Participative Design

It is essential to involve people with disabilities in developing AI-based tools to ensure their needs and concerns are considered (Fichten et al., 2022).

This is particularly crucial for older adults with disabilities who often face challenges with the installation and use of complex, intelligent elderly care products, resulting in inadequate supporting facilities (Teng & Ren, 2021). Failure to engage people with disabilities can result in designs that do not meet their needs and may be paternalistic. Therefore, oversampling people with disabilities can also help reflect their needs and concerns in the data.

3.2.3 Pervasiveness of the Medical Model of Disability

Previous studies have used AI from a medical perspective to help people with disabilities. For example, AI-based e-health systems were proposed for the early detection of autism and intellectual and developmental disabilities (2021). It uses sensors and AI algorithms to provide personalized treatments to patients. Another study used machine learning to predict the progression of disability in cases of MS.

3.2.4 Absence of Discussion of AI Bias

The reviewed articles on prediction failed to acknowledge bias or assess it across diverse populations, such as gender or disability types. This suggests that the studies needed to be aware of recognizing bias and implementing debiasing strategies. It is critical to emphasize the potential risks associated with AI, including bias and ways to mitigate them, in the research agenda of AI experts and academic curricula.

4 CONCLUSIONS

The development of artificial intelligence (AI) has been a remarkable achievement for humankind, as it has revolutionized the way we live, work, and communicate with one another. However, to ensure that AI systems are truly beneficial and inclusive, it is essential to involve interdisciplinary AI research with critical disability and social work scholars.

This collaboration can help shift our focus from a techno-centric approach to a more disability-centric one, ultimately leading to more effective and equitable AI systems. The findings of this scoping review provide a solid foundation for further research in this field, which can help us explore the potential of AI to support individuals with disabilities and create a more inclusive society. Therefore, we must continue to prioritize this area of research and work toward building AI systems that are not only advanced but also fair, safe, and accessible for all.

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