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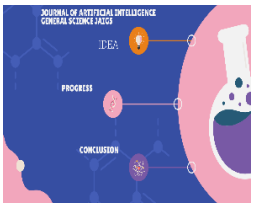

Role of AI in Enhancing Accessibility for People with Disabilities

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ABSTRACT

Artificial intelligence (AI) has emerged as a transformative force with profound implications for society, promising significant benefits for individuals with disabilities. While its potential is undeniable, AI also poses inherent risks, including ethical concerns that may exacerbate discrimination against marginalized groups. This paper provides a comprehensive examination of the advantages and drawbacks of AI for people with disabilities, with a particular emphasis on algorithmic biases. These biases, capable of shaping societal structures and influencing decision-making processes, have the potential to perpetuate unfair treatment and discrimination. In light of these challenges, the paper explores potential solutions to address these issues and ensure that AI serves the needs of all individuals, including those with disabilities.

Introduction

Artificial intelligence (AI) and algorithms have ushered in a new era characterized by both remarkable advancements and critical challenges.

AI, a concept first introduced by American computer scientist John McCarthy during the 1956 Dartmouth Conference, encompasses the study of computational models capable of mimicking human cognitive functions, notably reasoning and behavior. This emulation of human traits lies at the heart of AI's definition, as articulated by De Asís, who describes it as the endeavor to create systems that can think or act like humans, or exhibit rational thought and behavior.

The contemporary landscape of AI encompasses a spectrum of rapidly evolving technologies with vast potential to yield economic and social benefits across diverse domains. At its core, AI involves the emulation of human intelligence processes, including learning and self-correction. According to the European Commission, AI encompasses systems demonstrating intelligent behavior capable of analyzing their environment and autonomously pursuing specific objectives, whether in the form of software programs like voice assistants and image analysis tools or integrated into hardware devices like advanced robots and autonomous vehicles.

The functioning of AI can be delineated through various developmental phases, as outlined by the European Parliament. Early AI techniques, classified as "symbolic AI" or expertise systems, relied on precise algorithms devised by human experts to guide intelligent decision-making. Subsequent waves of AI innovation have focused on data-centric approaches, leveraging machine learning techniques such as artificial neural networks (ANNs) to autonomously learn from data inputs and generate intelligent responses. This evolution reflects a progression from task-specific "weak" AI to the aspirational realm of "strong" or "general" AI capable of exhibiting intelligence across diverse contexts.

Central to AI's operation are algorithms, which serve as the fundamental building blocks governing computational processes. Defined by scholars such as Hil and Monasterio Astobiza, algorithms are finite sets of instructions designed to solve problems, process data, and make decisions within AI systems. Whether guiding personalized recommendations or dynamic pricing strategies, algorithms wield considerable influence over various facets of daily life, often operating invisibly yet profoundly shaping human experiences.

The fusion of AI with big data, as elucidated by Bariffi, forms a symbiotic relationship wherein algorithms serve as the operational backbone of AI systems fueled by vast data repositories. This

synergy underpins a multitude of applications ranging from enhanced healthcare diagnostics to predictive analytics and personalized services.

While AI and algorithms hold promise for streamlining processes and driving innovation, they also engender ethical and societal challenges. Concerns regarding accountability, transparency, data privacy, and the erosion of human autonomy underscore the need for vigilant oversight and critical evaluation of AI's development and deployment. As we navigate the complex terrain of AI's evolution, it is imperative to uphold principles of ethical AI governance and safeguard fundamental rights, lest we risk relinquishing control to systems whose objectives diverge from human interests.

In light of these considerations, regulatory frameworks such as the European Union's proposed Regulation on Artificial Intelligence aim to mitigate risks and ensure that AI systems uphold fundamental rights and values. However, effective implementation of such measures requires ongoing scrutiny and a concerted effort to address the multifaceted implications of AI on individuals and society at large.

In conclusion, the advent of AI and algorithms heralds a transformative epoch marked by unprecedented opportunities and challenges. By fostering a nuanced understanding of AI's capabilities and limitations, we can harness its potential to enrich human endeavors while safeguarding against unintended consequences and preserving our collective well-being.

Effects of the AI phenomenon on people with disabilities

To begin, it is pertinent to shed light on the demographic of people with disabilities, currently estimated to comprise between 10% and 15% of the global population, equating to approximately 650 million to one billion individuals, a figure projected to rise due to population growth, medical advancements, and aging trends as highlighted by the World Health Organization (WHO). Notably, 80% of people with disabilities reside in developing countries, according to the United Nations Development Program (UNDP). Unfortunately, this demographic faces disproportionately adverse socioeconomic outcomes, including lower educational attainment, increased healthcare needs, elevated unemployment rates, heightened vulnerability to violence, greater incidence of poverty, and higher mortality rates.

Gender exacerbates these disparities, with women experiencing higher rates of disability incidence and thereby confronting intersecting disadvantages stemming from both disability and gender discrimination. The barriers to social and economic inclusion are multifaceted, encompassing physical environment and transportation accessibility, inadequacies in support devices and technologies, non-adapted media, deficiencies in service provision, and pervasive prejudices and discriminatory attitudes. Despite efforts, only 45 countries have specific legislation addressing disability rights.

Spain mirrors these global trends, as evidenced by data from the Disability, Personal Autonomy, and Dependence Situations Survey (EDAD-2020) conducted by the National Institute of Statistics. Key findings include:

- A total of 4.38 million individuals residing in nursing facilities reported a disability or limitation in 2020, affecting 94.9 per 1,000 individuals, with a higher prevalence among women and older age groups.

- Mobility issues represent the most prevalent form of disability, followed by household-related difficulties and challenges with self-care. Technical assistance or personal support is received by 3.3 million individuals.

- Educational inclusion efforts show progress, with nearly all minors between ages 6 and 15 enrolled in school, though curricular adaptations or support remain necessary for over half of these students.

- Employment rates among working-age individuals with disabilities stand at approximately one in four.

- Architectural and transportation barriers impede the access of 34% of individuals with disabilities to workplaces, schools, recreational facilities, and social gatherings.

- A significant proportion (39.4%) report difficulties accessing new technologies for informational or educational purposes.

Despite these challenges, significant strides have been made in advancing the rights and improving the quality of life for people with disabilities, as evidenced by initiatives such as the United Nations International Conference on the Rights of Persons with Disabilities (CRPD). This landmark treaty represents the first international legally binding instrument setting forth minimum standards for the rights of individuals with disabilities, marking a pivotal step toward inclusivity and equality.

The advent of artificial intelligence (AI) has prompted the European Union and its member states to implement strategies and regulations aimed at ensuring that individuals with disabilities, irrespective of gender, ethnicity, religion, beliefs, age, or sexual orientation, can fully exercise their human rights, attain equality of opportunity, access economic and societal participation, make autonomous decisions regarding their living arrangements, enjoy unrestricted mobility, and cease encountering discrimination on a daily basis.

However, despite the strides made in advancing the rights and opportunities of people with disabilities, achieving true equality remains an ongoing struggle. The emergence of AI, a paradigm shift marked by initial designs that often overlooked ethical and human rights considerations, particularly concerning the use of algorithms for governance, poses significant implications for these marginalized groups. AI's impact can either be positive, enhancing their lives and opportunities, or pose risks that curtail their equality and rights.

While AI holds immense potential to enhance the lives of people with disabilities, it is imperative to recognize that it is not a neutral or objective entity. Thus, it is essential to scrutinize, regulate, and mitigate any prejudicial implications that may impede the realization of human rights. This sentiment is echoed by the UN Special Rapporteur on the Rights of Persons with Disabilities, Gerard Quinn, in his report to the Human Rights Council, which examines the intersection of artificial intelligence and the rights of persons with disabilities. Quinn's study underscores the need to address the key issues arising from this emerging reality, drawing on insights from various analyses and offering recommendations to safeguard the rights of individuals with disabilities.

Against this backdrop, it is essential to explore how AI may impact the obligations outlined in the Convention on the Rights of Persons with Disabilities (CRPD), as well as Quinn's insights on this matter. Furthermore, we must assess the advantages and disadvantages of AI and algorithms for people with disabilities, considering both the opportunities they present and the potential challenges they pose to equity and rights protection.

We will commence with a concise overview of the analysis conducted by the Special Rapporteur on the Rights of Persons with Disabilities regarding the legal obligations outlined in the Convention on the Rights of Persons with Disabilities (CRPD) pertaining to the utilization and advancement of artificial intelligence (AI) (UN, 2021). In accordance with the approach adopted by the Commissioner of the European Council on Human Rights (Council of Europe, 2019), our presentation will adhere to the report's structured framework, emphasizing the imperative of

striking a balance between technological advancement and the protection of human rights. Two primary responsibilities are identified: the regulatory duty to prevent discrimination based on disability (art. 4, para. 1e) and the obligation to foster the early-stage design and development of information technologies (art. 9, para. 2h). This approach transcends the conventional concern of accessibility to new technologies for individuals with disabilities and delves into the implications of AI tools on their equality or potential discrimination, with the overarching objective of ensuring that no one is left behind (CERMI, 2019; European Commission, 2022). This objective is integral to a developmental model that acknowledges the diverse capabilities of individuals and recognizes people with disabilities as strategic assets for inclusive technological advancement.

The rights enshrined in the CRPD that bear significant relevance to the development and deployment of artificial intelligence systems include:

- Right to equality and non-discrimination (articles 2, 5, and 18)

The principle of inclusive equality (art. 5) lies at the core of the Convention, necessitating the assurance of all rights under conditions of full equality. This entails the elimination of all forms of discrimination, for which individuals with disabilities may require reasonable accommodations (art. 2) in the exercise of their rights. Such accommodations, to be effective, demand an exhaustive assessment of each person's individual circumstances, tailored to their specific needs. The Rapporteur further underscores that, in the context of AI, this obligation may encompass an anticipatory dimension, preemptively implementing justified accommodations without awaiting formal requests. This applies to areas such as AI-powered selection or interview tools and biometric technology used for identity verification in accessing essential public services.

- Right to autonomy and decision-making (articles 3, 12, and 23)

Articles 3 (general principles) and 12 (equality before the law) of the Convention uphold the intrinsic worth of individuals and their inherent rights to autonomy and decision-making. This necessitates informed, genuine, transparent, and effective consent, never to be presumed. The utilization of machine learning and profiling in AI poses challenges to these rights, particularly in areas such as health screenings, reproductive rights, and genetic testing, as expressed in reports by international organizations.

- Right to privacy (articles 22 and 31)

The right to privacy and data protection assumes critical importance in the context of AI, particularly concerning the collection of data pertaining to individuals with disabilities, the content they generate—all of which they must be empowered to access, securely share, comprehend the usage of, control, and delete—as well as the data managed by algorithms.

• Right to work and employment (articles 27 and 9)

The Convention safeguards individuals against discrimination based on disabilities in the workplace, encompassing aspects such as recruitment procedures, job continuity, promotions, and working conditions, while also mandating the provision of reasonable accommodations. A comprehensive interpretation of articles 27 and 9 necessitates that employers mitigate the discriminatory impacts of AI tools, which may pose significant exclusion risks for people with disabilities due to unconventional attributes, particularly in pre-interview screening processes.

• Right to education (article 24)

AI systems have the potential to significantly impact education, ideally facilitating inclusive education practices, personalized support measures, and reasonable adjustments at all educational levels, in accordance with the Convention's provisions. However, there are concerns that AI could perpetuate segregation in education if not properly managed, potentially reversing progress towards the inclusion of individuals with disabilities by making decisions or presenting arguments that segregate them from their peers.

• Right to an adequate living standard and social protection (article 28)

AI introduces two primary risks in this domain: firstly, the opacity of decision-making processes concerning social services and public support for individuals with disabilities, and secondly, the potential reinforcement of barriers to labor market access due to job displacement caused by automation.

• Right to health (article 25) and right to habilitation and rehabilitation (article 26)

The Convention prohibits discrimination against individuals with disabilities in accessing healthcare and rehabilitation services. Despite the undeniable benefits of AI-driven tools, there is a risk that certain healthcare services, medical coverage, or insurance benefits may be denied on the basis of disability.

• Freedom of expression and opinion and access to information (articles 21 and 29)

The Convention guarantees the right to freedom of expression and access to information without interference, which AI can potentially enhance by ensuring the availability of information in

accessible formats and technologies. However, there is a concern that AI usage may impede the freedom of association for organizations representing people with disabilities, limiting their online presence and content dissemination, or leading to online harassment targeted at vulnerable groups such as individuals with disabilities.

• Participation in political and public life (article 29) - Active consultation (articles 4 and 7)

The utilization of a diverse array of AI tools in electoral processes has the potential to enhance the political engagement of individuals with disabilities, provided that these tools are developed in an inclusive manner, accommodating their specific needs and considerations. The Convention also mandates proactive measures to ensure vigilant oversight, preventing the unethical use of artificial intelligence that could hinder or restrict the political participation of people with disabilities.

• Public procurement (article 4) - Active consultation (articles 4 and 7)

Both the Convention and various international documents call upon governments and public administrations to procure AI systems and tools that are inclusive and non-discriminatory towards individuals with disabilities. Moreover, individuals with disabilities must be actively engaged in the design, development, and implementation of policies and systems based on artificial intelligence. This entails diversifying the teams involved in these processes, ensuring representation from individuals with disabilities, and ensuring that AI products and services designed for children with disabilities prioritize their best interests, respect their evolving capabilities, and guarantee their meaningful participation in decision-making processes.

• Other rights and policy areas

It is crucial to harness the potential of AI while mitigating its negative impact on the rights and well-being of individuals in various fields and in connection with other rights. This includes addressing risk situations and humanitarian emergencies (art. 11) to prevent modern slavery, human trafficking, and child exploitation concerning individuals with disabilities. Additionally, in the realm of international cooperation (art. 32), new technologies can be leveraged to promote inclusive artificial intelligence systems.

AI and the use of algorithms as an opportunity

People with disabilities have been among the earliest adopters of interactive AI tools in their daily lives (Bigham and Carrington, 2018). Since then, the potential of AI and new technologies to benefit individuals with disabilities and promote inclusive equality across various domains covered by the CRPD, such as employment, access to goods and services, independent living, and education, has become increasingly evident (UN, 2021). The UN Special Rapporteur on the Rights of Persons with Disabilities emphasizes the importance of AI being "used in an adequate and

responsible way" or "properly adjusted to individual circumstances" in all of these cases. Numerous areas and applications cited in his report exemplify the liberating potential of artificial intelligence for people with disabilities. Some noteworthy examples include:

- Accelerating sustainable development directly and indirectly benefiting people with disabilities (UN, 2021; McClain-Nhlapo and Samant Raja, 2021).

- Innovating and implementing effective reasonable accommodations for people with disabilities, along with the positive impact of AI systems on assistive technology. For instance, navigation tools can enhance mobility for individuals who are blind or partially sighted, while software technologies for eye tracking or voice recognition aid those with hearing or speech impairments. Such tools facilitate communication, information access, and education for people with disabilities (Guo et al., 2019).

- Utilizing adapted learning platforms to personalize instruction for students with disabilities and improve their access to education through individualized mentoring or educational games, fostering social skills and problem-solving abilities. Voice-to-text converters facilitate communication for individuals with speech impairments, eliminating the need for interpreters. Avatars using sign language are also beneficial for individuals with hearing impairments (Global Disability Innovation Hub, 2021).

- AI applications are valuable in mental health, disease diagnosis, and rehabilitation (Global Disability Innovation Hub, 2021).

- Enhancing the independent living of people with disabilities through the integration of robots and other AI tools in households to provide medical care and assistance. Access to technology is recognized as fundamental for achieving equal participation in this area by the UN (Global Disability Innovation Hub, 2021).

In summary, the pivotal role of technology, particularly artificial intelligence, in enhancing accessibility and inclusion cannot be overstated. Numerous contributions emphasize its positive impact on the daily lives of people with disabilities, including communication, mobility, independent living, and access to services. However, there are also concerns that AI may sometimes overpromise and lead to frustration among people with disabilities (Smith and Smith, 2021).

Artificial Intelligence's discriminatory systems and uses for people with disabilities: Algorithm biases undermining equality and fostering discrimination

The design and implementation of AI systems confront a crucial ethical dilemma: addressing the unequal treatment resulting from data management concerning specific groups, which is inherently embedded – whether consciously or not – in algorithms. Particularly significant in this regard are the inequalities and discriminations perpetuated through stereotypes, biases in data collection and management, and the limited participation of people with disabilities in many economic, social, and cultural spheres, historically marginalized.

The prevalent biases present in algorithms constitute a widespread and critical issue that disproportionately harms certain groups – including women, people with disabilities, and the LGBTI community. An examination of the existing biases and the inadequate construction and utilization of algorithms concerning people with disabilities would entail the following considerations:

- The datasets used to construct algorithms are pivotal: AI systems make decisions based on this information, and numerous points where bias may emerge must be addressed. Incorporating disabilities into artificial intelligence necessitates not only understanding and interpreting the datasets but also comprehending the decision-making process of AI systems to prevent discrimination (UN, 2021).

These datasets are derived from individuals' daily activities (such as health status, consumption habits, and behaviors) and compiled through various platforms and sources. While the data is presumed to be accurate, significant gaps exist (such as limited information from certain individuals or communities), along with elements that may contain overtly discriminatory aspects. Regarding the former, Quinn (UN, 2021) exemplifies the low probability of encountering a disabled person when searching for the term "athlete" on an AI-enabled search engine, highlighting the persistence of historical biases instead of updating information and models. This perpetuates discrimination against historically excluded groups, given that inclusive practices have only recently emerged (Mills and Whittaker, 2019).

- Initial screening systems and platforms pose a negative factor because their lack of complete accessibility and failure to incorporate reasonable adjustments result in the generation of inaccurate and biased data.

- Bias can also stem from the limited experience used by AI models to calibrate the varying abilities of individuals, relying on inappropriate and non-rigorous information. This occurs when an AI system is applied in contexts or for cases different from those for which it was originally developed, leading to intentional or unintentional biases and prediction errors.

- Additionally, people with disabilities do not constitute a homogeneous group, posing an additional challenge in addressing equity in algorithm use. The diverse types, levels, and nuances of disabilities complicate efforts to treat them as a simple variable, amplifying the difficulty in correcting potential algorithm biases.

- Human influence in the process cannot be disregarded. Individuals responsible for deciding what data to store, where and how to categorize it, and which parameters to use introduce subjective value judgments that may be erroneous for various reasons. Furthermore, data labeling involves subjective assessments.

- Biased datasets may not accurately represent society if they over-represent or under-represent certain identities in a particular context. Biased data may accurately reflect an unfair society, as they mirror the discrimination experienced by certain groups, including people with disabilities.

In addition to these considerations, there is significant criticism concerning facial recognition systems and emotional recognition systems.

In the realm of facial algorithms, many inherent biases have been identified (UN, 2021; Binns and Kirkham, 2021), particularly prejudicial to people with disabilities due to their unreliable nature stemming from imbalances in facial features not accounted for by the AI system's programmed model. Moreover, users with physical alterations such as Down syndrome, achondroplasia, cleft lip or palate, as well as blind individuals or those with visual impairments, encounter operational challenges with facial analysis programs due to variations in facial anatomy or conditions like albinism. Additionally, AI systems often struggle to interpret the facial expressions of autistic individuals, those with Williams syndrome, or others with atypical facial expressions resulting from conditions such as cerebral stroke, Parkinson's disease, or Bell's palsy (Guo et al., 2019).

Emotional recognition systems, used to make value judgments about individuals, pose various problems related to confidentiality and privacy (UN, 2021).

Bias can manifest in algorithms at different stages, including defining the purpose and limitations of an AI model, selecting inputs for pattern recognition and decision-making, and evaluating data. Discrimination against people with disabilities resulting from AI and algorithm use is rooted in

deficient or unrepresentative data, lack of transparency in technology making it challenging to detect discriminatory effects, historical discriminations, insufficient consideration of AI's intervention level and relevance in various fields and contexts, and failure to fulfill the responsibility to make reasonable adjustments, exacerbating disadvantages for people with disabilities and increasing their vulnerability. Bariffi (2021) similarly outlines the risks posed by AI to the enjoyment and exercise of rights for people with disabilities, including: a) the use of AI systems to identify and potentially discriminate against people with disabilities; b) the creation of AI systems based on normalization models that exclude or fail to consider people with disabilities; c) the design of AI systems based on data containing stereotypes and prejudices regarding disability, and d) the use of AI systems that hinder the participation or decision-making of people with disabilities.

Final Reflections and Recommendations

The advent of AI and algorithmic technologies marks a significant leap forward with profound implications across various domains. In the context of addressing the challenges faced by individuals with disabilities, AI offers promising avenues to enhance their well-being, quality of life, and the realization of their rights. However, it is imperative to critically examine the drawbacks and potential risks associated with AI, emphasizing the need for ethical considerations to underpin its design and deployment.

Equity, ethics, and the protection of human rights should serve as guiding principles in shaping AI systems. It is crucial to prioritize the participation of individuals with disabilities and their representative organizations in the development and implementation of AI policies and systems. Furthermore, transparency and accountability are essential to mitigate biases and discriminatory outcomes in AI algorithms.

While challenges exist in ensuring transparency due to the complexity and opacity of AI systems, efforts must be made to uphold ethical standards and foster inclusivity. Responsible data practices, including the development of inclusive datasets and the mitigation of biases, are paramount in promoting equitable AI solutions.

Governments have a central role in creating regulatory frameworks that safeguard the rights of individuals with disabilities and ensure the ethical use of AI. Collaboration between the public and private sectors is vital to address these issues comprehensively.

Moreover, international and national organizations dedicated to human rights advocacy must continue to prioritize the inclusion of individuals with disabilities in AI discussions and policies.

Initiatives such as the development of a national plan for inclusive AI underscore the importance of integrating disability perspectives into data management practices.

It is essential to recognize both the risks and opportunities associated with AI for individuals with disabilities. While AI has the potential to enhance accessibility and inclusion, it must be developed and regulated in alignment with human rights principles.

Ultimately, fostering an inclusive and ethical approach to AI requires collective efforts from stakeholders across various sectors. By prioritizing diversity, equity, and human dignity, we can ensure that AI serves the well-being and advancement of all individuals, particularly those who have historically faced discrimination and marginalization.

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