

## Artificial intelligence technologies focused on the care and development of people with disabilities.

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### ABSTRACT

Artificial intelligence (AI) has established itself as a technology with the potential to improve the autonomy, communication, and social inclusion of people with special abilities. However, some barriers may limit their access to education, health, and employment due to the lack of existing knowledge about AI applications in the field of disability. The objective of this study was to conduct a systematic literature review (SLR) to identify the current state of artificial intelligence technologies focused on the care and development of individuals with special abilities, categorizing solutions, algorithms, and domains of application. The methodology followed the PRISMA checklist model, structured around planning, searching, selecting, and extracting information. The search was conducted in five high-impact academic databases (Scopus, IEEE Xplore, ScienceDirect, and ACM), applying rigorous inclusion and exclusion criteria. Of the total of 314 initial records, 30 primary studies were selected for further analysis. The most frequent applications include intelligent virtual assistants, augmentative and alternative communication systems, automatic sign language translators, brain-computer

interfaces, adaptive learning platforms, and innovative mobility devices. In terms of algorithms, the use of convolutional and recurrent neural networks, support vector machines, decision trees, unsupervised clustering, and reinforcement learning techniques stands out, with performance rates exceeding 90% in voice, gesture, or sign language recognition tasks. These technologies have contributed to educational, therapeutic, and communicative contexts, as well as emerging applications in assisted mobility and inclusive work environments. In conclusion, AI is a key tool for supporting inclusion, promoting accessibility, personalized learning, and rehabilitation. Its contribution is framed within ethical and user-centered aspects that promote equity and autonomy for people with disabilities, while laying a solid foundation for future public policies and inclusive technological developments.

**Keywords:** Artificial Intelligence; Disability; Inclusion; Comprehensive Development; Personalized Care

## **Tecnologías de inteligencia artificial enfocadas al cuidado y desarrollo de personas con discapacidad.**

### **RESUMEN**

La inteligencia artificial (IA) se ha consolidado como una tecnología con el potencial de mejorar la autonomía, la comunicación y la inclusión social de las personas con capacidades especiales. Sin embargo, existen algunas barreras que pueden limitar su acceso a la educación, la salud y el empleo, debido a la falta de conocimiento existente sobre las aplicaciones de la IA en el ámbito de la discapacidad. El objetivo de este estudio fue realizar una revisión sistemática de la literatura (RSL) para identificar el estado actual de las tecnologías de inteligencia artificial orientadas a la atención y el desarrollo de personas con capacidades especiales, categorizando las soluciones, los algoritmos y los dominios de aplicación. La metodología siguió el modelo de la lista de verificación PRISMA, estructurada en torno a la planificación, búsqueda, selección y extracción de información. La búsqueda se llevó a cabo en cinco bases de datos

académicas de alto impacto (Scopus, IEEE Xplore, ScienceDirect y ACM), aplicando rigurosos criterios de inclusión y exclusión. De un total de 314 registros iniciales, se seleccionaron 30 estudios primarios para un análisis más profundo. Las aplicaciones más frecuentes incluyen asistentes virtuales inteligentes, sistemas de comunicación aumentativa y alternativa, traductores automáticos de lengua de señas, interfaces cerebro-computadora, plataformas de aprendizaje adaptativo y dispositivos innovadores de movilidad. En cuanto a los algoritmos, destaca el uso de redes neuronales convolucionales y recurrentes, máquinas de vectores de soporte, árboles de decisión, técnicas de agrupamiento no supervisado y aprendizaje por refuerzo, con tasas de desempeño superiores al 90 % en tareas de reconocimiento de voz, gestos o lengua de señas. Estas tecnologías han contribuido a contextos educativos, terapéuticos y comunicativos, así como a aplicaciones emergentes en movilidad asistida y entornos laborales inclusivos. En conclusión, la IA es una herramienta clave para apoyar la inclusión, promoviendo la accesibilidad, el aprendizaje personalizado y la rehabilitación. Su contribución se enmarca en aspectos éticos y centrados en el usuario que fomentan la equidad y la autonomía de las personas con discapacidad, al tiempo que sienta una base sólida para futuras políticas públicas y desarrollos tecnológicos inclusivos.

**Palabras clave:** Inteligencia artificial; Discapacidad; Inclusión; Desarrollo integral; Atención personalizada.

## 1. Introduction

The rapid advancement of artificial intelligence (AI) has revolutionized various fields of human knowledge, generating tools capable of transforming the lives of historically excluded groups, such as people with special abilities (Masliković et al., 2025) (Robert et al., 2024), (Almufareh et al., 2024). This sector of the population faces structural barriers in accessing education, health, employment, and social participation, which requires inclusive technological solutions adapted to their needs (Hashemi et al., 2023), (Universidad Politécnica Salesiana, 2025). Some AI frameworks are being leveraged by people with disabilities, such as personalized learning, communication tools, smart

devices, and interfaces with specific eMoorthy, 2025, pp.91-114) (Mitre & Zeneli, 2024), (Tripathi et al., 2024), (Leong, 2025), (L. Smith, 2024), (Smith, 2024, pp. 121-134), (Simone, 2024) (Pagliara *et al.*, 2024). Ly, recognizing these technologies in depth from a technical and scope perspective, can improve the optimization and design of new AI solutions aimed at improving the care and development of people with disabilities.

In this context, this research focuses on analyzing the design, scope, and potential of AI-based technologies for the care and comprehensive development of individuals with various disabilities, including sensory, cognitive, motor, and other types of disabilities. The study is part of a systematic literature review that compiles, organizes, and analyzes the main technological developments in AI aimed at improving the quality of life and autonomy of these individuals (Pinazo-Hernandis, 2024). Through the current state of the literature, it was possible to identify the most widely used applications, the contexts in which they have been implemented, the results obtained, and the existing limitations, especially in environments with limited technological resources, as is the case in many developing countries (Mitre & Zeneli, 2024), (Grados-Zubieta et al., 2025), (Pin, 2025), (Yepes et al., 2024), (Salinas et al, 2024). These findings enable the systematization of theoretical and empirical knowledge on inclusive technological solutions, providing strategic recommendations that promote accessibility, equity, and innovation for people with disabilities (Giansanti et al, 2025). In addition, it could highlight the ethical, social, and technical challenges that accompany the implementation of AI in this area, contributing to the formulation of public policies by entities and managers, the design of user-centered technology, and the reduction of digital divides (Salinas, 2024)

The research questions guiding this review are: Q1) What AI solutions have been proposed or implemented to support or assist people with disabilities?; Q2) What machine learning algorithms are used in AI solutions that contribute to the activities of people with disabilities?; Q3) What has been the performance of models tested with machine learning algorithms that support the development of people with disabilities?; Q4) What are the domains or fields of application of AI in assisting people with disabilities? The document is organized into sections: Introduction, Method, Results, Discussion, and Conclusions, following the PRISMA model (Page & McKenzie, 2021)

## 2. Methods

A systematic review of the literature was conducted, following the stages outlined in the PRISMA model: planning, search and selection, and information extraction. The protocol developed in the systematic review of the literature is summarized below:

### 2.1. Planning

In the planning stage, the following steps were organized: defining the search objective, formulating research questions, and establishing inclusion and exclusion criteria. The main objective of this review was to identify the Artificial Intelligence technologies that are used in the care and development of people with special abilities. To address this purpose, four key research questions were formulated. These questions, along with their descriptions and motivations, are presented in Table 1.

**Table 1.** Systematic literature review research questions.

Research Questions	Motivation and Expected Results
Q1. What AI solutions have been proposed or implemented to support or assist people with disabilities?	Identify and classify existing AI solutions, such as augmentative communication assistants, voice and gesture recognition systems, smart mobility devices, adaptive learning environments, and digital accessibility tools. This inventory will allow us to recognize the state of the art and guide new developments.
Q2. What machine learning algorithms are used in AI solutions that contribute to the activities of people with disabilities?	Systematize the most commonly used algorithms (deep neural networks, supervised learning, classification models, natural language processing, computer vision, among others) and analyze their effectiveness in specific tasks to determine which algorithms are most appropriate for each type of disability or need.

Q3. What has been the performance of models tested with machine learning algorithms that support the development of people with disabilities?	Document performance metrics, such as accuracy, sensitivity, specificity, and error rate, in empirical studies to evaluate the reliability of the models applied. Quantitative evidence is expected to support the effectiveness of these solutions in real-world contexts.
Q4. What are the domains or fields of application of AI in assisting people with disabilities?	Determine in which sectors AI has been most successfully implemented (inclusive education, rehabilitation, health, workplace inclusion, communication, and mobility). To identify priority areas of impact and scenarios where there are still gaps in research or a need for technological innovation.

## 2.2. Search and selection

The search and selection phase began with the identification and definition of key terms for analyzing artificial intelligence technologies applied to individuals with special abilities. For this purpose, an initial group of preliminary articles was established, which allowed for the standardization of the most commonly used terms and the construction of effective search strings. The selected terms included: "*artificial intelligence*," "*people with disabilities*," "*assistive technology*," "*educational inclusion*," "*autonomy*," "*virtual assistants*," "*voice recognition*," and "*personalized learning*." Based on these concepts, various combinations were formulated, one of the most effective chains being: "artificial intelligence" AND (disability OR impaired) AND assistance AND (techniques OR solution OR technologies).

The search was conducted in four scientific databases: Scopus, IEEE Xplore, ScienceDirect, and ACM Digital Library. These sources were selected for their relevance in multidisciplinary areas, including engineering, computer science, education, health, and social sciences.

**Table 2. Application of the search string in the information sources.**

No	Database	Search string used
1	Scopus	TITLE-ABS-KEY (( "artificial intelligence" AND ( disability OR impaired ) AND assistance AND ( techniques OR solution OR technologies )))
2	IEEE Xplore	("artificial intelligence" AND (disability OR impaired) AND assistance AND (techniques OR solution OR technologies))
3	Science Direct	("artificial intelligence" AND (disability OR impaired) AND assistance AND (techniques OR solution OR technologies))
4	ACM Digital Library	[All: "artificial intelligence"] AND [[All: disability] OR [All: impaired]] AND [All: assistance] AND [[All: techniques] OR [All: solution] OR [All: technologies]]

During the evaluation process, 314 records were initially identified from the databases. Of these, 192 were discarded because they did not meet the established criteria, resulting in a final sample of 114 studies evaluated in depth, from which 26 primary articles demonstrating high relevance and methodological quality were selected. Finally, four additional articles were added using manual extraction methods, bringing the total to 30 primary articles.

The quality assessment of the selected studies was carried out using a peer review matrix, considering two groups of criteria: 1) Approach: Thematic relevance regarding the use of AI with people with disabilities, type of disability addressed, context of application (educational, therapeutic, social, etc.). 2) Content: Clarity of objectives, methodological description, data quality, technological application, and results obtained. Each study was assessed using a weighted scoring system: 1 point for full compliance with the criterion, 0.5 points for partial compliance, and 0 points for non-compliance.

Articles with a score above 70% were classified as optimal quality, those between 50% and 69% as acceptable, and those below 50% as moderate quality. Only acceptable and optimal articles were included in the final analysis.

### 2.3. Information extraction

The primary purpose of the information extraction stage in this systematic review was to collect and organize relevant data from the selected primary studies, thereby evaluating the implementations, techniques, and results of using artificial intelligence (AI) in the context of care and development for people with special abilities.

To this end, structured criteria were defined to enable a rigorous evaluation of the content, including the purpose of each study, the contexts in which it was applied, the types of technologies used, the data analyzed, the metrics for assessing effectiveness, and the methodological approaches employed. This systematization was crucial for understanding the practical applicability of AI in educational, therapeutic, communicative, and social inclusion contexts. Below is a detailed description of the criteria used for the extraction and analysis of information:

**Table 3. Description of the criteria for extracting information.**

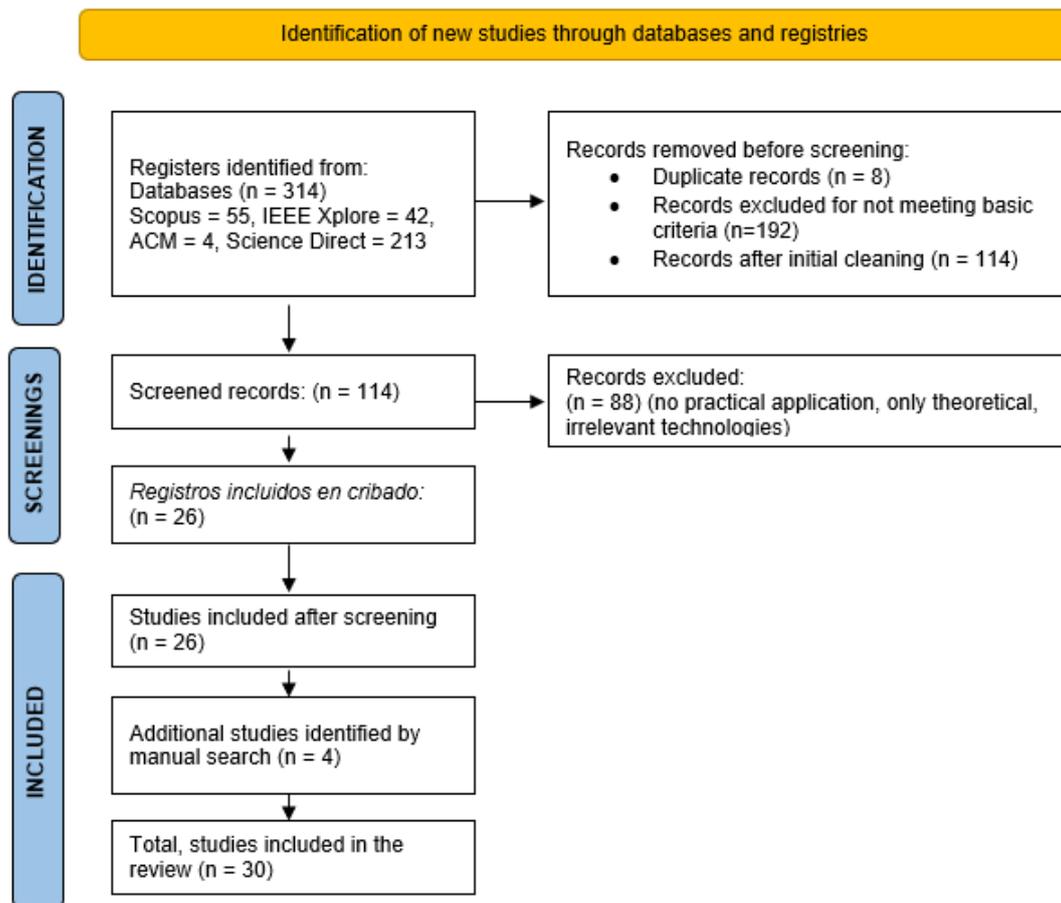
<b>Criterion</b>	<b>Description</b>
<b>C1. Purpose of the study</b>	Identify the main objective of the study, the problem addressed, and its alignment with the inclusive approach to the use of AI for people with disabilities.
<b>C2. Application contexts</b>	Determine the areas where AI technologies were implemented (education, health, rehabilitation, communication, employment, mobility, etc.).
<b>C3. AI technologies used</b>	Recognize the types of technologies used (virtual assistants, speech recognition, computer vision, predictive algorithms, adaptive interfaces, etc.).
<b>C4. Data and characteristics analyzed</b>	Describe the types of data used (e.g., voice, images, platform behavior, responses to stimuli, etc.), as well as their origin and processing.

<b>C5. Impact indicators</b>	Identify the metrics used to evaluate the effect of the technology (improvement in autonomy, cognitive skills, communication, social integration, etc.).
<b>C6. Recommendations and limitations</b>	Analyze the recommendations proposed by the authors, as well as the technical, social, or ethical limitations mentioned in the studies.

### 3. Results

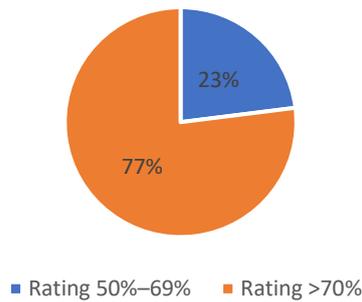
The search and selection of articles followed the PRISMA model guidelines in three phases: identification, screening, and inclusion. In the identification phase, 314 studies were collected through systematic searches in Scopus, IEEE Xplore, ScienceDirect, and ACM. After removing duplicates and applying filters, 192 studies were excluded that did not meet the inclusion criteria, such as a direct relationship with artificial intelligence applied to people with disabilities, peer review, or full-text availability.

A total of 114 articles were reviewed in abstracts and full texts, of which 88 were excluded because they did not present applications of artificial intelligence in contexts of inclusion, lacked empirical evidence, or dealt with technologies unrelated to the subject of study, such as financial or industrial automation systems. This review yielded 26 articles, to which four primary studies were added, identified through manual searches of secondary literature, institutional websites, and technical documents. The final sample consisted of 30 studies, which were used to answer the research questions. This analysis provided scientific evidence based on the use of artificial intelligence technologies in the development of people with disabilities. Figure 1 graphically presents the flow of the systematic review process.



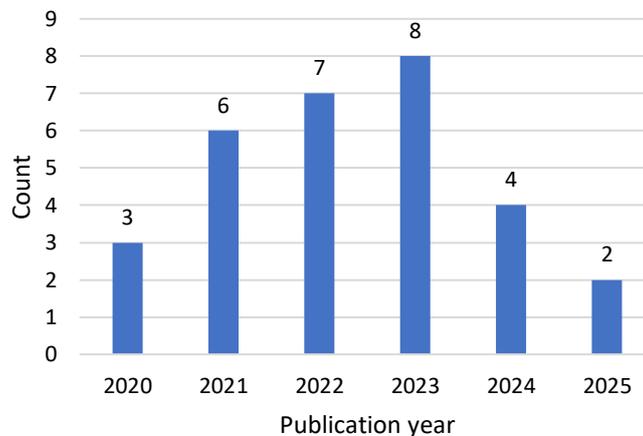
**Figure 1. PRISMA diagram of identification, screening, and selection of primary articles.**

Some articles were not selected because they focused on contexts unrelated to the objective of this systematic review, such as industrial automation or theoretical analyses without empirical evidence in populations with disabilities. As part of the analysis of the quality of the primary studies, 114 articles were evaluated, and 30 scientific articles were ultimately selected that met both methodological and thematic criteria, allowing their abstracts and full content to be investigated in accordance with the information needs of this research. Figure 2 presents the results of the analysis, which assessed the inclusive approach, the practical application of AI technologies, methodological clarity, and contextual relevance. Of the 23 articles, 23 obtained a score above 70%, while seven articles scored between 50% and 69%. All studies addressed direct applications of AI in educational, therapeutic, or social contexts.



**Figure 2. Studies included in the systematic review, by database**

Figure 3 shows the temporal distribution of the primary studies included in the review, with the highest concentration between 2021 and 2023. In 2023, there were eight studies, in 2022, a total of 7, and in 2021, 6, indicating sustained growth during that period. The years 2020 and 2015 saw fewer publications, reflecting the initial stages of exploration before the increase in research driven by post-pandemic digitization.



**Figure 3. Studies included by year of publication**

Chronological analysis suggests that inclusive artificial intelligence is emerging as a growing line of research, with studies testing solutions such as virtual assistants, adaptive platforms, and augmentative communication systems for people with sensory, motor, or cognitive disabilities. The increase in publications indicates advances in methodological design, with the use of mixed approaches, empirical validations, and

greater participation of beneficiaries in the development and evaluation of solutions (Alam et al., 2025). This evolution provides a framework for future research aimed at expanding the scope of artificial intelligence to improve the autonomy and quality of life for people with disabilities (Abidi, et al., 2024)

### 3.3. Discussion

In response to question Q1: What AI solutions have been proposed or implemented to support or assist people with disabilities? The studies reviewed agree that artificial intelligence solutions applied to assisting people with disabilities focus on devices and platforms geared toward augmentative and alternative communication (AAC), voice recognition, and natural language processing (NLP) systems, intelligent virtual assistants, computer vision applications, and adaptive learning platforms (Salinas et al. 2024), (Sierra *et al.*, 2025). These technologies have expanded opportunities for interaction, autonomy, and social participation for people with motor, cognitive, or sensory limitations (Joshi et al., 2020). For example, the development of brain-computer interfaces enables users with reduced mobility to control external devices, while automatic sign language translation systems facilitate communicative inclusion (Troya et al., 2024). In the field of education, AI-based solutions adapt content to the student's learning style, contributing to equitable access to inclusive education (Jiménez *et al.*, 2024)

Advances in artificial intelligence (AI) have catalyzed the development of highly personalized assistive technologies designed to enhance the quality of life, autonomy, and social participation of individuals with disabilities (Cabello, et al., 2025). These technologies, based on machine learning algorithms, computer vision, natural language processing, and intelligent adaptive systems, enable more effective interaction between individuals and their physical, cognitive, and social environments (Troya Santillán, 2024).

In addition, systems based on computer vision and convolutional neural networks enable the interpretation of the environment through cameras integrated into mobile or wearable devices (González et al., 2025). Technologies such as Microsoft Seeing AI or Be My Eyes, supported by object recognition and text reading models (OCR + NLP),

help by providing real-time auditory feedback, facilitating mobility and document reading (Bariffi, 2024).

Meanwhile, AI models applied to real-time transcription and machine translation have given rise to tools that convert spoken language into text or sign language (Navarrete-Cazales & Manzanilla-Granados, 2023). Representative examples include automatic subtitling systems based on Automatic Speech Recognition (ASR) and animated avatars generated by generative adversarial networks (GANs) to represent linguistic signs (Bariffi, 2025)

Regarding Q2: What are the machine learning algorithms used in AI solutions that contribute to the activities of people with disabilities? The literature reviewed shows a predominance of deep neural network algorithms, particularly convolutional networks for computer vision and recurrent networks for speech recognition and sequential data analysis (Lanzagorta-Ortega et al., 2022). Likewise, the use of support vector machines and decision trees is reported in applications for biomedical pattern classification and motor behavior prediction (Manirajee et al., 2024) In adaptive learning environments, reinforced learning techniques are used to customize study itineraries according to user performance. Complementarily, unsupervised clustering algorithms have been used to identify profiles of educational and therapeutic needs (Ryalat, 2025). This methodological diversity reflects the versatility of AI in addressing diverse issues related to disability (Sánchez, 2025).

Regarding Q3: How have models tested with machine learning algorithms that support the development of people with disabilities performed? Empirical results indicate that the models implemented have achieved varying levels of accuracy and efficiency depending on the type of application (Almufareh et al., 2023). In the case of computer vision systems applied to gesture or sign language recognition, accuracy rates of over 90% have been reported, validating their usefulness in inclusive communication. Similarly, virtual assistants trained with NLP have demonstrated significant improvements in user-machine interaction, resulting in reduced response times and fewer interpretation errors. Okolo et al applied a Convolutional Neural Network (CNN) to sign language recognition in people with hearing, achieving an accuracy of 95% with an F1-score of 0.93 (Okolo et al., 2024). Other studies achieved accuracy values close

to 90% in medical image classification tasks for assisted diagnosis (Okolo et al., 2024), (Alvarado-Salazar, 2022). However, the literature warns that the performance of the models is contingent upon the quality of the training data, the application context, and the cultural and linguistic adaptation of the algorithms, which presents a challenge for the generalizability of the results (Castro, 2025).

According to Q4: What are the domains or fields of application of AI in assisting people with disabilities? Systematic studies identify the primary areas of application in three key areas: education, therapy, and communication (Alvarado-Salazar, 2022). In education, AI has been applied to adaptive learning platforms that promote the inclusion of students with sensory or cognitive disabilities (Ghosh et al., 2025). In the therapeutic field, tools have been developed to monitor and predict clinical progress in physical and neurocognitive domains, as well as systems for predicting clinical outcomes (Peñarreta et al., 2025). In the communicative domain, AI-based AAC systems and automatic sign language translators stand out, enabling the social participation of nonverbal people (Hashemi, 2023), (Sánchez, 2025). Emerging applications include assisted mobility (intelligent vehicles, AI-controlled wheelchairs) and inclusive work environments, where intelligent systems act as mediators of accessibility (Castro, 2025), (Flor-Unda *et al.*, 2025). This overview highlights the cross-cutting nature of AI as a tool that facilitates inclusion and equity for people with disabilities (Shahzad et al., 2024), (Fernández et al., 2025).

#### **4. Conclusions**

The review enabled us to analyze and synthesize artificial intelligence applications designed to enhance the care, autonomy, and social inclusion of people with disabilities. Thirty articles that met the inclusion and exclusion criteria were reviewed, which allowed us to answer the research questions posed. The results show that the most common solutions include personalized virtual assistants, voice and gesture recognition systems, adaptive learning platforms, and brain-computer interfaces, used to support communication in people with speech impairments, motor rehabilitation processes, personalization of educational materials, and activities of daily living.

In terms of the algorithms used, deep neural networks, supervised and unsupervised learning methods, and reinforcement learning techniques were identified. These models were trained on biometric, behavioral, and contextual data, including interaction patterns on digital platforms, neurological signals, response times, and emotional reactions, which enabled more personalized outputs tailored to users' needs.

The models evaluated showed improvements in functional autonomy, communication, and social integration, along with high levels of accuracy in pattern recognition. Complementary metrics such as user satisfaction, perceived cognitive load, and caregiver or teacher adaptability were included, broadening the understanding of the impact of these technologies. However, the results depend on the quality of the training data and the context of the application, highlighting the need for greater standardization and validation across diverse environments.

In the domains of application, artificial intelligence has focused on the educational, therapeutic, and communicative fields, with emerging developments in assisted mobility and workplace accessibility. The research employed methodologies such as feature selection, sensory data normalization, and cross-validation, aiming to design scalable solutions applicable in contexts with varying resource conditions.

Advances in Artificial Intelligence in the field of inclusion underscore the need for coordinated public policies, including regulatory frameworks for digital accessibility, as well as a shared responsibility among educational, healthcare, and labor institutions. Consequently, technological solutions can be consolidated as standardized tools through widespread adoption, benefiting people with disabilities.

The findings in this study also suggest the need to promote the co-design of accessible technologies, in accordance with international standards for universal accessibility and user-centered ethical principles. In this way, interface designs, device interoperability, and algorithm transparency can be framed within an inclusive and equitable approach, supported by social participation.

This review provides a structured basis for researchers, developers, and policymakers interested in promoting inclusion through intelligent technologies. The

findings identify advances and research opportunities in areas such as the integration of affective data, the use of innovative urban environments, and the design of systems based on universal accessibility with the active participation of people with disabilities. A collaborative and ethical approach is key to making artificial intelligence a sustainable and globally accessible tool.

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