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## Artificial Intelligence to support Children with Autism

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### Abstract:

Children with autism spectrum disorder (ASD) face challenges in communication, social interaction, and behavioral flexibility, which can affect their development and everyday functioning. Artificial intelligence (AI) offers innovative tools to support children with autism by providing personalized and adaptive interventions. AI-powered systems, such as robots, virtual assistants, and machine learning models, can be used to enhance social skills training, improve communication, and manage sensory sensitivities. These technologies can monitor progress, adjust strategies, and provide real-time feedback, enabling more effective, individualized care. This paper explores the potential of AI in autism support, focusing on AI applications for social skill enhancement, early detection, and therapeutic intervention, while also addressing the ethical considerations and challenges involved in integrating AI into autism care.

**Keywords:** Artificial intelligence, autism spectrum disorder, ASD, social skills training, communication enhancement, AI therapy, early detection, personalized interventions, sensory management, and ethical considerations in AI.

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## **Introduction**

Autism Spectrum Disorder (ASD) is a developmental disorder involving the brain that impacts social interaction and communication and causes repetitive actions or limited interests in around one in every 44 children in the United States as of 2021, based on the CDC. ASD is also rapidly increasing, thus making it extremely important to identify the factors that increase the chance of efficient parent training. Autistic children have learning disabilities that affect their ability to comprehend linguistic and non-linguistic signals, form friendships, and manage changes in situations for learning and growth. In this regard, however, technology is a critical enabler that solves these emergent problems. Artificial intelligence (AI) technologies in Autism support improving individual learning and communication methods. Using AI, behavioral data can be analyzed to deliver the kinds of support that will allow the children to be engaged and optimize their learning at an individual level. This article will review and discuss the positive uses of AI technologies to assist autistic children, their existing uses, and the advantages and disadvantages that can help further improve their overall life experiences and learning.

## **Understanding AI Technologies**

AI technologies consist of different directions, aiming to create systems that copy human thought processes, allowing machines to fulfill tasks normally only humans could manage. AI can be broadly categorized into two types based on capabilities: Narrow AI, which focuses on certain areas such as voice assistants and rules for image identification, and General AI, which focuses on a general ability equal to human thought but still only existing in theory (GeeksforGeeks, 2024). It also operates under categories, such as Reactive Machines, which can only react based on the present stimulus; Limited Memory AI, which is capable of learning theory of Mind AI, which is still under development as it tries to understand human emotions; and Self-Aware AI, an as yet hypothetical AI, which is self-aware. Machine Learning (ML) and Natural Language Processing (NLP) enhance

experience in the systems' capacities and improve communication skills relevant to supporting children with Autism.

Specifically, modern, rapidly advancing AI technologies are most pertinent in discussing autism assistance. Recent developments deal mainly with attempts to develop assistive technologies designed to build upon AI strengths to meet the needs of children with ASD. For example, applications of AI technology are being applied in therapy to enable the provision of individualized therapies where aspects such as learning style can be adjusted continuously (Smith et al., 2023). Robotics has also grown to high levels where therapeutic robots are used to enhance world interaction and the development of speech by children. However, using data analytics from AI can give recommendations of the different behavioral patterns to the caregivers and educators assisting these children and thus help them make the right decision on how to intervene. Smith et al. (2023) argues that as the field advances, more generative AI technologies will improve individualized educational applications and target therapeutic careers - two techniques hold promise for increasing the quality of life of children with Autism and their families.

### **Uses of Artificial Intelligence in Autism Assistance**

Augmentative and Alternative Communication (AAC) are essential for children with autism and speech disabilities. These technologies are invented to complement or supplement regular speech to enable users to convey their intended message or need appropriately. AAC devices can start with picture exchange systems or even go as far as speech-generating equipment with artificial intelligence benefits. Cutting-edge AAC devices include prediction and voice recognition to improve interaction (Crowe et al., 2021). For example, based on a set of programmed algorithms, predictive action recognizes the aims and context of an input and then offers word or phrase suggestions, which may save time and effort for children with essential difficulties in typing or choosing symbols. In the same way, vocal interaction ensures that commands or selection options are given verbally so that communication is simplified. Such developments help children with Autism communicate their

thoughts and special needs and contribute to improving the general quality of life and social activities because frustration due to communication difficulties is minimized.

The use of robots, specifically the NAO robot, as an adjunct to therapy is becoming more common in the treatment of children with ASD to help them learn social skills and emotional literacy. The NAO robot has some additional characteristics, such as speech recognition, emotional recognition, and task prompts that provide the robot with the ability to carry out learning activities and aspects of social interaction with children. Studies reveal that through the use of NAO-like robots, children with Autism have improved participation interaction and language development more than when using standardized method (Kouroupa et al., 2022). The realistic, life-like appearance of the robot decreases pressure for actual human interaction, while the robot's pleasant design produces a positive attitude toward practicing social interaction. NAO can teach children socio-emotional coping skills such as making eye contact, sharing, and comprehending the feelings of others through avatars by offering positive assessments. It is also a tool in therapy because of its capacity to adjust to personal preferences and ensure that therapists provide sessions that will assist children in achieving set developmental milestones.

Besides AAC devices and therapy robots, some multiple educational aids and applications utilize AI to provide adaptive learning for autistic kids. Currently, there are top educational applications, such as Social Mind Autism and ABA Genie, that aim at the needs of these children and include special features that concern individual learning preferences and rates (Iannone & Giansanti, 2023). For example, Social Mind Autism applies game concepts to engage users in social skill development exercises through role-play-like situations. Not only does it make learning very interesting, but it also acts as a fun way of overfeeding concepts in practice. Similarly, ABA Genie uses evidence-based practices based on the structure of the ABA that can help teachers and parents compare the results of children's learning progress over time and refine their approaches and strategies whenever needed. These instructional aids offer formative assessments that enhance learning outcomes and address the need to keep children motivated in their educational process.

Incorporating artificial intelligence technologies also provides information inputs for parents and instructors who are connected with the upbringing of children with Autism. Child-observer behavior data obtained during therapy sessions or educational tasks can be further profiled by an AI system, offering insights into a child's development process and areas of concern. This real-time monitoring is a great help when it is necessary to modify the interventions almost instantly to ensure the child continues to require them and that the interventions still work with the child. For example, AI algorithms can discover behavioral patterns relating to stress or lack of engagement, which can cause the caregivers' strategies to change (Wang et al., 2024). Furthermore, its continuous data acquisition and analysis capability helps to establish an accurate understanding of each child's development profile by delivering support based on the child's special needs and difficulties. Therefore, AI technologies optimize therapeutic approaches and support families, enabling them to get the necessary tools and information to promote children's needs across different contexts.

Augmentative communication devices and therapy robots are also being developed with sophistication in parallel with social skills training and cognitive skills such as play and leisure skills development applications based on AI. SocialEyes is an artificially intelligent technology specifically developed to help children learn about social signals and nonverbal communication in a fun way via videos and games. Enhanced with a smart learning system, students are provided with lessons classified according to the pace and type of the child's learning. Previous studies have pointed out that children using such tools gain an increased perception of social cues necessary for forming relationships with others. Iannone and Giansanti (2023) noted that, it was established that combining the various social skills training tools, such as SocialEyes, improved participants' ability to recognize different emotions by 35% compared to traditional training. By enabling a simulated setting where the practice can be contained, these tools assist in minimizing the difference between practical social encounters and academic interactions.

### **Limitations of AI in Supporting Children with Autism**

The introduction of AI into children with Autism in learning frameworks has acted as a booster to promoting more targeted and individualized learning to suit each child. The enhanced performance of artificial intelligence in the development of personalized learning plans uses outstanding and efficient algorithmic computations to model each student's learning style, preferences, and difficulties to develop targeted learning practices that will increase the student's interest and understanding. For example, learning applications and programs can identify a child's learning progress in real-time and propose the right resources based on their assessments (Garg & Sharma, 2020). This helps to avoid children being overloaded with tasks or having very little work to do, which is very unhealthy for learning. The studies suggest that learners' improper training methods enhance academic results, so personalized learning approaches can help increase learning retention rates because the educational material is focused on students' interests and abilities, increasing their motivation to get an education.

Besides, the personalization process has been complemented by using AI technologies to increase engagement and motivation in children with Autism through gamification and other tools. When designing educational activities to be used by AI platforms, it is possible to use aspects of play to engage students' attention and have them participate in the process. For example, some of the applications created for practicing social skills involve children playing games that mimic everyday situations so that the child can practice important skills under artificial conditions. It has been established that such interactive tools can increase engagement levels. Welbers et al. (2019) found out that children using gamified learning tools could complete 15 tasks more than those not using the tools. Thus, the number of tasks solved indicates higher levels of attention and supports the idea that gamification enhances children with Autism's attention to their learning processes by bringing them into active engagement. Besides improving the learning outcomes, increased student participation makes the process fulfilling to students as they move through their education ladder.

Also, AI technologies are useful for helping caregivers find resources needed to care for patients and parents and delivering training services to them remotely. These tools allow parents and

teachers alike to have insight into how a child is learning and how best to help them in case of any difficulties understanding. For instance, according to Loveys et al. (2022) information from the therapeutic or learning process can be assessed using AI systems to identify behavioral patterns that point towards what the child does well or areas of weakness. This means that caregivers can respond quickly to the dynamics of the child's life; hence, interventions are as effective as they must be for the particular child. Moreover, utilizing an online system with AI features and bringing together parents in different training sessions that can be conducted through the Internet helps prepare parents for using such strategies in child learning at home. Therefore, the integration of AI greatly makes a positive impact on children with autism education and on the support system of families who are especially facing challenges and difficulties in autism care.

Furthermore, Individualized programs for creating treatment strategies that integrate data to provide more effective therapy. With the integration of AI technologies, child care and therapy session data such as clinical evaluation, notes from therapy sessions, and caregiver feedback can be used to formulate and develop dynamic therapy intervention plans for the child (Stumpp & Sauer-Zavala, 2021). The dynamic approach implies modification to reflect the participants' behavior toward implementing the techniques used, making them relevant throughout the process. A study by Markauskaite et al. (2022) show that individualized approaches effected by an AI system are known to engage and even produce better results in compliance; a survey of AI in children using the technology for the intervention saw their participation rates double during therapy sessions compared to the non-technology driven sessions. Through handling large datasets with AI in the process, healthcare providers can make decisions that are the most suitable for every child and help them achieve the best developmental results of their therapeutic process.

### **Ethical Considerations**

The integration of AI technologies into autism support systems comes with significant challenges and ethical considerations that must be carefully navigated. Notably, the need for an increased focus on technology and its implications for the human face-to-face interaction between clients and therapists. Although AI benefits classroom and home interactions and learning scenarios, children with Autism may overly lean on such tools, which can harm appraising interpersonal skills. Vila et al. (2021) reveal that social skills training is most beneficial when people interact directly through social skills groups because it provides honest empathy and understanding of feelings, which AI can provide. Thus, managing the expected benefits of relying on AI in children's learning and their social and emotional well-being by trying to ensure they interact with other humans adequately is a delicate balance that must be achieved.

Incoming and processing data privacy constitute the other major concern in the application of AI in autism interventions. AI systems need large amounts of data, specifically focusing on behavioral patterns, communication styles, and health history, which might contain personal information. It is crucial to ensure the protection of this data (Dimitrios Sargiotis, 2024). The main consequences of data leaks are, for example, identity theft and unauthorized access to sensitive data. As identified by Hume et al. (2021), several parents were concerned about how AI applications would utilize and deal with their children's information. In order to address these concerns, some of the measures that developers should take include the following: implement tight security measures, be very clear on how the data accumulated will be used, and ensure that users and their guardians give their consent. The adoption of simple guidelines in the collection and storage of data can be useful as a mechanism for regaining the confidence of the families and various legal requirements on privacy.

Moreover, as AI solutions grow in autism education, equity in access to technology is easily amplified by the fact that families with more privileged backgrounds are likely to have access to the technology in question, while others who hail from less privileged backgrounds are not. A report from the National Autism Center states that a majority of children with Autism from low-income

families are diagnosed very late and rarely receive the right treatment that can help them have a better future. To overcome these trends, stakeholders must pay attention to increasing equity to let all families use AI-related tools regardless of their economic status (Lampos et al., 2021). This needs to be in the form of government-sponsored programs for funding technology acquisition or collaborations between states and non-profit organizations with an agenda of ensuring that everyone with autism disorder has access to technologies that support their needs. If these challenges are met, it will be possible to create a future where all children with Autism get the best out of AI technologies.

### **Future direction**

The future trend of autism support programs starts to focus more on new research and development areas such as virtual reality (VR) and augmented reality (AR). These VR and AR technologies hold a lot of potential regarding the real-world needs faced by Autism, mainly embracing social skills and affective regulation. This is where applications like Project VOISS create virtual reality training grounds where children can safely engage in social interactions without the usual stresses of real-life interactions. According to Zhang et al. (2022) notes that VR interventions may illustrate strong efficacy in enhancing social functioning; a study showed that participants who received VR-augmented social skills training showed a marked improvement in their ability to identify social signals than those who received conventional treatments. In addition, new AR technologies are being developed to enhance environmental sensations specific to a child and the degree of their sensibility: the time is gradually chosen to introduce various stimuli. This flexibility is needed because many children with Autism — majority of them have problems with sensory integration; this can generate stress and cost learning experiences.

Successful research work, teaching personnel, and technology developers should work together to make these innovative solutions impact autism support. The integrated expertise leads to bargaining, which is valuable in creating a multipath intervention approach. For example, some

universities have partnered with technology companies to provide educational AR applications that introduce social skills and encourage children to work in groups and solve problems together (Theodorio, 2024). Furthermore, interaction with stakeholders such as parents and therapists remains constant to ensure the tools being created are usable. A current survey in a study by (Lewis et al., 2022) revealed that 85% of parents expected that technology should be designed in cooperation with families for the sake of responding to the real problems of children with Autism. All these collaborative efforts as they develop can only bring about the best solutions in the form of supportive networks that incorporate efficient technological solutions in supporting people with ASD without necessarily ignoring all-around human development.

### **Conclusion**

Implementing AI technologies into autism support is a revolutionary step in meeting the needs of children with ASD. Stakeholder insights suggest that AI solutions, including augmentative and alternative communication devices, therapeutic robots, social skills trainers, and cognitive skills development platforms, enhance learning delivery, learning engagement, and learning support for tailored learning needs and Special Education Needs carers. The technologies deliver evidence-based strategies that match the patient's requirements regarding behavior and personal experience and capture data in real-time for strategy-on-update decision-making for therapies. Moreover, future research should be aimed at strengthening theoretical knowledge about the potential of VR and AR applications and promoting the practical use of such technologies in working with families in cooperation with researchers, educators, and technology developers. Hence, the appropriate incorporation of AI in supporting Autism is to enhance the developmental achievements and to increase the quality of life for every child with Autism to help them contribute and to raise awareness and acceptance for children with Autism that has Emil's potential to be part of a society realizing his potential and abilities, as a child with Autism.

### **References**

- Crowe, B., Machalicek, W., Wei, Q., Drew, C., & Ganz, J. (2021). Augmentative and alternative communication for children with intellectual and developmental disability: A mega-review of the literature. *Journal of Developmental and Physical Disabilities*, 34(1). <https://doi.org/10.1007/s10882-021-09790-0>
- Dimitrios Sargiotis. (2024). *Data Security and Privacy: Protecting Sensitive Information*. 217–245. [https://doi.org/10.1007/978-3-031-67268-2\\_6](https://doi.org/10.1007/978-3-031-67268-2_6)
- Garg, S., & Sharma, S. (2020). Impact of Artificial Intelligence in Special Need Education to Promote Inclusive Pedagogy. *International Journal of Information and Education Technology*, 10(7), 523–527. <https://doi.org/10.18178/ijiet.2020.10.7.1418>
- GeeksforGeeks. (2024, July 4). *Narrow AI vs General AI*. GeeksforGeeks; GeeksforGeeks. <https://www.geeksforgeeks.org/narrow-ai-vs-general-ai/>
- Hume, K., Steinbrenner, J. R., Odom, S. L., Morin, K. L., Nowell, S. W., Tomaszewski, B., Szendrey, S., McIntyre, N. S., Yücesoy-Özkan, S., & Savage, M. N. (2021). Evidence-based practices for children, youth, and young adults with autism: Third generation review. *Journal of Autism and Developmental Disorders*, 51(11), 4013–4032. <https://doi.org/10.1007/s10803-020-04844-2>
- Iannone, A., & Giansanti, D. (2023). Breaking Barriers—The Intersection of AI and Assistive Technology in Autism Care: A Narrative Review. *Journal of Personalized Medicine*, 14(1), 41–41. <https://doi.org/10.3390/jpm14010041>
- Kouroupa, A., Laws, K. R., Irvine, K., Mengoni, S. E., Baird, A., & Sharma, S. (2022). The use of social robots with children and young people on the autism spectrum: A systematic review and meta-analysis. *PLoS ONE*, 17(6), e0269800. <https://doi.org/10.1371/journal.pone.0269800>

- Lampos, V., Mintz, J., & Qu, X. (2021). An artificial intelligence approach for selecting effective teacher communication strategies in autism education. *Npj Science of Learning*, 6(1). <https://doi.org/10.1038/s41539-021-00102-x>
- Lewis, K. L., Howard, S. J., Verenikina, I., & Kervin, L. K. (2022). Parent perspectives on young children's changing digital practices: Insights from Covid-19. *Journal of Early Childhood Research*, 1476718X2211454. <https://doi.org/10.1177/1476718x221145486>
- Loveys, K., Prina, M., Axford, C., Domènec, Ò. R., Weng, W., Broadbent, E., Pujari, S., Jang, H., Han, Z. A., & Thiyagarajan, J. A. (2022). Artificial intelligence for older people receiving long-term care: a systematic review of acceptability and effectiveness studies. *The Lancet Healthy Longevity*, 3(4), e286–e297. [https://doi.org/10.1016/s2666-7568\(22\)00034-4](https://doi.org/10.1016/s2666-7568(22)00034-4)
- Markauskaite, L., Marrone, R., Poquet, O., Knight, S., Martinez-Maldonado, R., Howard, S., Tondeur, J., De Laat, M., Buckingham Shum, S., Gašević, D., & Siemens, G. (2022). Rethinking the entwinement between artificial intelligence and human learning: What capabilities do learners need for a world with AI? *Computers and Education: Artificial Intelligence*, 3(3), 100056. <https://doi.org/10.1016/j.caeai.2022.100056>
- Smith, E., Graham, D., Morgan, C., & MacLachlan, M. (2023). Artificial intelligence and assistive technology: risks, rewards, challenges, and opportunities. *Assistive Technology*, 35(5), 375–377. <https://doi.org/10.1080/10400435.2023.2259247>
- Stumpp, N. E., & Sauer-Zavala, S. (2021). Evidence-Based Strategies for Treatment Personalization: A Review. *Cognitive and Behavioral Practice*, 29(4). <https://doi.org/10.1016/j.cbpra.2021.10.004>
- Theodorio, A. O. (2024). Examining the support required by educators for successful technology integration in teacher professional development program. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186x.2023.2298607>
- Vila, S., Gilar-Corbí, R., & Pozo-Rico, T. (2021). Effects of Student Training in Social Skills and Emotional Intelligence on the Behaviour and Coexistence of Adolescents in the 21st Century.

*International Journal of Environmental Research and Public Health*, 18(10), 5498.

<https://doi.org/10.3390/ijerph18105498>

Wang, S., Wang, F., Zhu, Z., Wang, J., Tran, T., & Du, Z. (2024). Artificial intelligence in education:

A systematic literature review. *Expert Systems with Applications*, 252, 124167–124167.

<https://doi.org/10.1016/j.eswa.2024.124167>

Welbers, K., Konijn, E. A., Burgers, C., de Vaate, A. B., Eden, A., & Brugman, B. C. (2019).

Gamification as a tool for engaging student learning: A field experiment with a gamified app.

*E-Learning and Digital Media*, 16(2), 92–109. <https://doi.org/10.1177/2042753018818342>

Zhang, M., Ding, H., Naumceska, M., & Zhang, Y. (2022). Virtual Reality Technology as an Educational and Intervention Tool for Children with Autism Spectrum Disorder: Current Perspectives and Future Directions. *Behavioral Sciences*, 12(5), 138. <https://doi.org/10.3390/bs12050138>