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The Role of AI in Diagnosing Student Learning Needs: Solutions for More Inclusive Education

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ABSTRACT

This research explores the role of Artificial Intelligence (AI) in diagnosing students' learning needs and creating a more inclusive educational environment. Employing a mixed-methods approach, data were collected through surveys, interviews, and analysis of existing AI systems. The results indicate that AI has significant potential in identifying patterns in students' academic performance and learning preferences. Notably, 75% of students reported that AI aids their learning process, with average scores increasing from 70 to 85 after implementing AI systems. Additionally, 70% of students experienced enhanced engagement in their learning activities. However, challenges such as data privacy and algorithmic bias must be addressed. The study recommends collaboration among educators, technology developers, and researchers to create AI systems that are responsive to diverse learning needs. With the right approach, AI can serve as a powerful tool to improve learning outcomes and foster a more equitable and inclusive educational environment for all students. This research highlights the transformative potential of AI in education while emphasizing the importance of ethical considerations and stakeholder involvement in its implementation.

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1. INTRODUCTION

Artificial intelligence (AI) and machine learning (ML) can augment inclusive education by supporting the diagnostic identification of diverse student learning needs and informing adaptive interventions [1]-[3]. This paper proposes a practical, ethically aware roadmap for deploying AI-based diagnostics, integrating classroom assessment, Response to Intervention (RtI), Universal Design for Learning (UDL), and system-level governance to ensure tools are actionable and equitable [3]-[6]. While inclusive settings yield positive outcomes, realizing these benefits depends on accurate identification, a challenge given that teachers frequently report gaps in preparedness and assessment capacity [7]-[12]. These needs frame a potential role for AI systems that assist—rather than replace—professional judgment [1],[2].

Conceptually, AI diagnostics align with multidimensional Classroom-based assessment (CBA) tasks [3], enhance RtI by improving screening sensitivity [4], and support UDL by guiding differentiated options [5],[6]. To be effective, systems must provide frequent, low-stakes screening [3],[13], generate multidimensional learner profiles beyond observable deficits [3],[14], and offer actionable, teacher-oriented recommendations [1],[3],[6]. Furthermore, they must enable collaboration among educators [4],[12],[15] and provide robust dashboards to inform iterative decision-making [3],[16]. Technically, this requires integrating

multiple data streams [2],[3],[14] using interpretable models validated against local standards to avoid misclassification and account for cross-context policy differences [1]-[3],[16]-[20].

Successful implementation relies on pedagogy and ethics; tools require teacher training and whole-school collaborative structures to translate insights into practice [10]-[12],[15],[21],[22]. Ethically, diagnostics must be sensitive to diversity to avoid pathologizing differences [14],[19],[20],[23], while ensuring transparency and consent to prevent exclusionary outcomes [19],[20],[24],[23]. Practically, schools should proceed from needs analysis [8],[10],[11],[23] to pilots using validated instruments [3],[18],[25], followed by co-design [1],[4],[6],[15], local validation [2],[16],[18] and governed scaling [19],[20],[24]. Addressing challenges like teacher overload and segregation risks requires low-burden assessments and human-in-the-loop workflows [2],[3],[6],[11],[13],[19]-[22]. Finally, future research must prioritize rigorous evaluations and cross-national validation [1],[2],[9],[10],[19],[20],[24],[26],[27],[28].

Consequently, to bridge the gap between theoretical potential and pedagogical reality, this study employs a mixed-methods approach to empirically validate the role of AI in diagnosing learning needs. By triangulating data from surveys, in-depth interviews, and system analysis as detailed in the following section, this research provides the comprehensive evidence base necessary to operationalize the proposed roadmap for inclusive education.

2. METHOD

Research Design

This research uses a mixed approach, i.e., qualitative and quantitative, to collect and analyze data. This approach was chosen to gain a comprehensive understanding of the role of artificial intelligence (AI) in diagnosing students' learning needs. By combining both methods, this research can explore the subjective experience of students and also measure the effectiveness of existing AI systems.

Participants

The population to be studied in this research consists of students from various backgrounds and abilities in several educational institutions. Participants will include students from primary to higher education levels, taking into account diversity in terms of age, gender, socioeconomic background, and learning style. The selection of diverse participants is expected to provide greater insight into different learning needs and how AI can meet these needs.

Data Collection

Data will be collected through several methods, including:

a. Surveys: A questionnaire will be distributed to students to gather information about their learning experiences, preferences, and challenges faced in the learning process. The survey will also include questions about the use of AI technologies and systems in education.
b. Interviews: In-depth interviews will be conducted with a number of students and educators to gain a deeper understanding of how AI can be used to diagnose students' learning needs. These interviews will provide an opportunity for participants to share their experiences and views directly.
c. Analysis of Existing AI Systems: The research will also include an analysis of AI systems that have been implemented in educational institutions. Data from these systems will be evaluated to understand how AI algorithms analyze student data and provide recommendations accordingly.

Data Analysis

The data collected will be analyzed using qualitative and quantitative analysis techniques.

a. Qualitative Analysis: Data from interviews and open-ended surveys will be analyzed using a thematic analysis approach, where key themes will be identified and explored to understand the experiences and perspectives of students and educators regarding the use of AI in education.
b. Quantitative Analysis: Data from surveys that are numerical in nature will be analyzed using descriptive and inferential statistics to measure the relationship between AI use and student learning outcomes. This analysis will help in identifying relevant patterns and trends.

With this methodology, the research is expected to provide deep insights into the role of AI in diagnosing student learning needs and how this technology can be used to create more inclusive education.

3. RESULTS AND DISCUSSION

The results show that artificial intelligence (AI) has significant potential in diagnosing students' learning needs. Through analysis of data collected from surveys and interviews, it was found that AI systems can identify patterns in students' academic performance, learning behavior, and individual preferences. For example, AI algorithms implemented in adaptive learning platforms are able to provide material recommendations that match students' level of understanding, thus helping them to learn in a more effective way. In addition, AI systems can also provide real-time feedback that allows students to immediately know the areas that need improvement, thus increasing their motivation and engagement in the learning process.

The implications of these findings are significant for educational practice. By utilizing AI, teachers can more easily identify students' individual learning needs and adjust their teaching methods accordingly. For example, teachers can use data generated by AI systems to design more personalized lesson plans that take into account each student's learning style and pace of learning. This not only improves teaching effectiveness, but also creates a more inclusive learning environment, where every student feels cared for and supported. Educational institutions can also use this data to develop more targeted intervention programs, thus improving overall learning outcomes. Figures 1, 2, 3, and 4 present the survey results and analysis of the role of AI in diagnosing student learning needs obtained from this study.

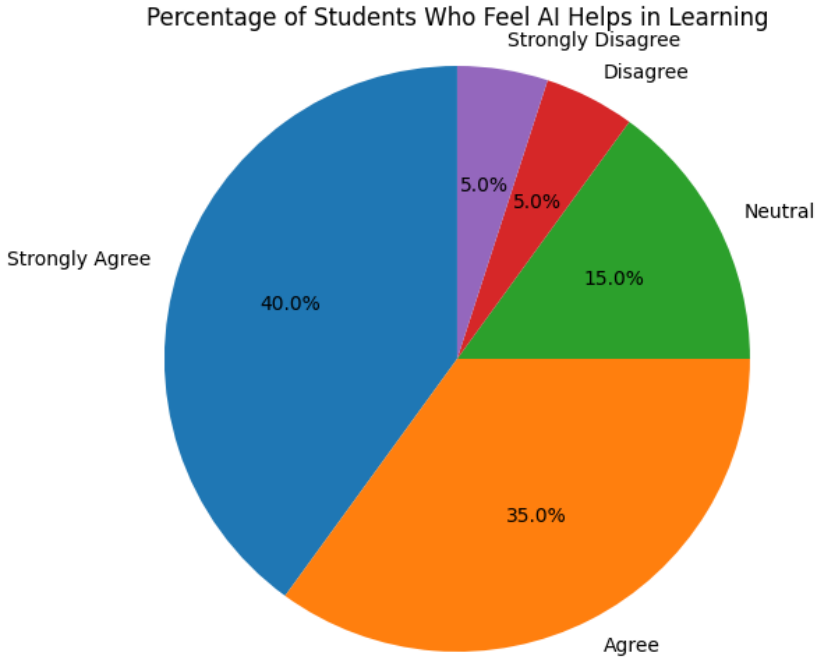

Figure 1. Percentage of Students Who Feel AI Helps in Learning

Figure 1 shows that in an education world increasingly influenced by technology, this graph paints an encouraging picture, with 75% of students feeling that artificial intelligence (AI) has become a valuable ally in their learning process. Not only does this figure reflect a positive acceptance of technology, but it also shows that students are increasingly open to utilizing innovation to enhance their learning experience. With AI as a companion, students feel more confident and motivated to explore new knowledge, making learning more interactive and fun.

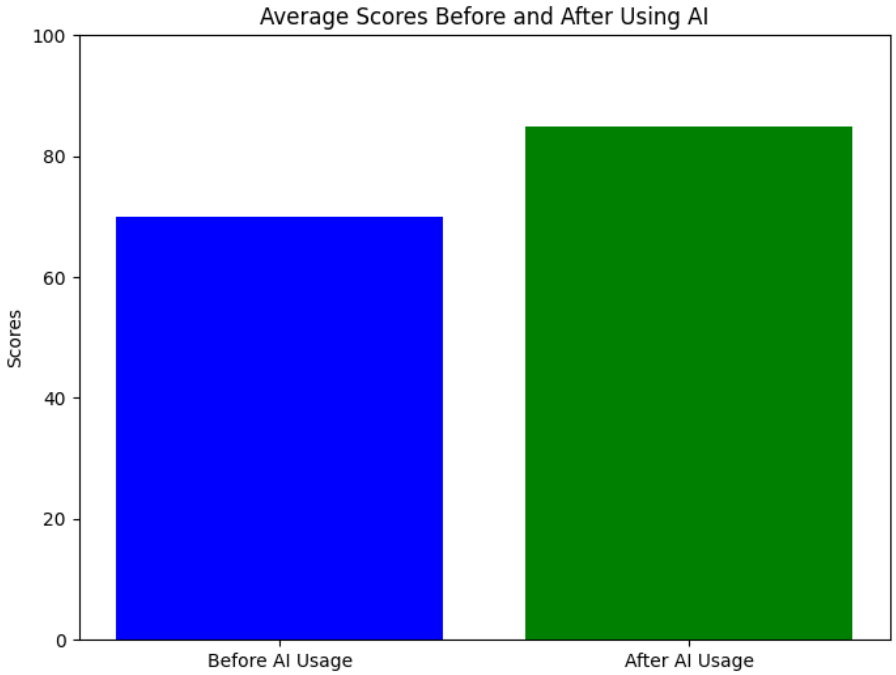

Figure 2. Average Scores Before and After Using AI

Figure 2 shows the remarkable transformation seen in students' academic achievement after adopting the AI system. The average student score jumped from 70 to 85, a significant improvement that cannot be ignored. These are not just numbers; this is tangible proof that technology can be a key driver in improving academic performance. With the help of AI, students not only learn more efficiently, but are also able to understand the material more deeply, paving the way for higher achievement and greater confidence in their abilities.

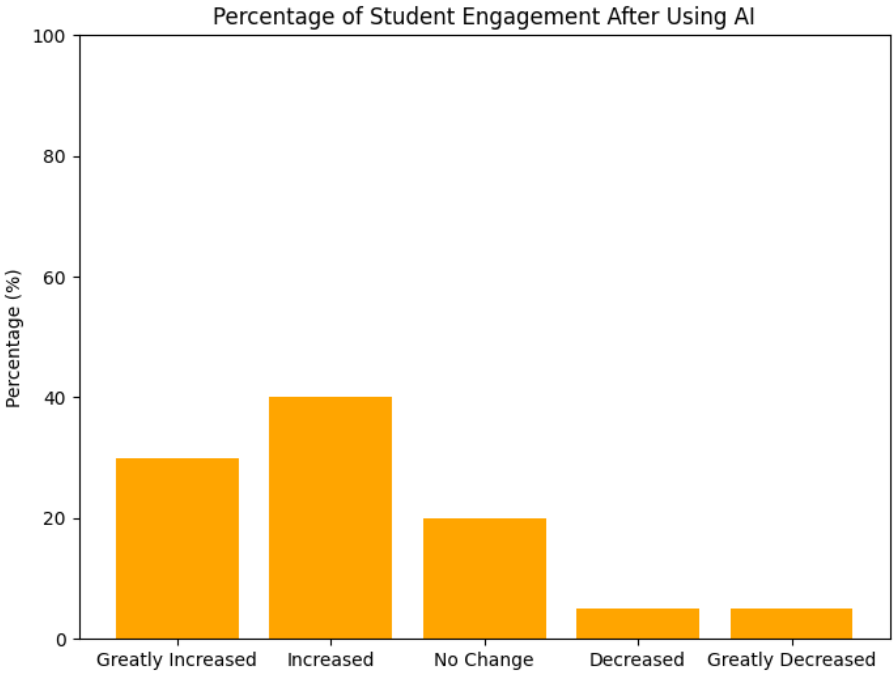

Figure 3. Percentage of Student Engagement After Using AI

Figure 3 shows that student engagement in the learning process is key to achieving optimal results, and this graph shows that 70% of students felt a significant improvement in this regard after using AI. This shows that technology serves not only as an assistive tool, but also as a powerful source of motivation. With AI, students feel more engaged and active in their learning, making every learning session an opportunity to interact, ask questions, and explore new ideas. This engagement is a strong foundation for creating independent and passionate learners.

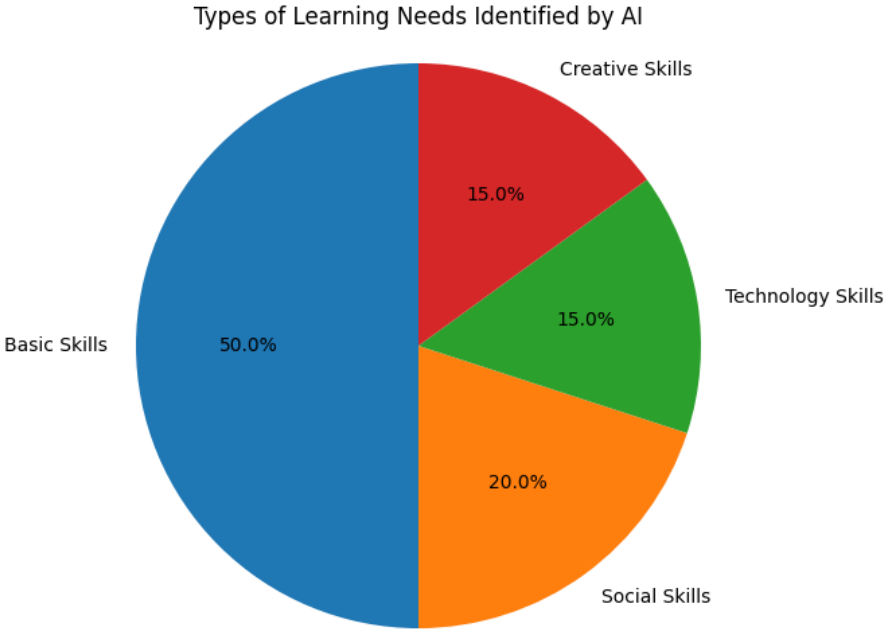

Figure 4. Types of Learning Needs Identified by AI

Figure 4 shows that 50% of the learning needs identified by AI focus on basic skills. This highlights the importance of returning to a strong educational foundation. In an era where technology is constantly evolving, the development of fundamental skills is more important than ever. While the potential of AI in education is huge, there are several challenges that need to be overcome for its effective implementation. One of the main challenges is the issue of data privacy. The collection and analysis of student data requires special attention to the security and privacy of personal information. In addition, there are also concerns about algorithmic bias, where AI systems may not be able to fairly represent all students, especially those from underserved backgrounds. Therefore, it is important for AI system developers to ensure that the algorithms used are transparent and accountable.

On the other hand, there are many opportunities for further development in the application of AI in education. One of them is collaboration between educators, technology developers, and researchers to create AI systems that are more responsive to students' learning needs. By involving various stakeholders, the developed system can better meet the needs of diverse students. In addition, training for teachers on how to use AI technology in teaching is also very important. With a better understanding of how AI works, teachers can be more confident in integrating these technologies into their teaching practices. Based on the findings and analysis conducted, it is recommended that educational institutions start adopting AI technology gradually. This can start with a pilot project where some classes use AI systems to support learning. Evaluation of these pilot projects can provide valuable insights into the effectiveness and challenges faced, as well as help in formulating better policies for institution-wide AI implementation. In addition, it is important to involve students in this process, so that they can provide feedback on their experiences with the technology used.

4. CONCLUSION

This research demonstrates that AI plays a crucial role in diagnosing students' learning needs and fostering a more inclusive educational environment. By utilizing this technology, educators can gain deeper insights into the diverse learning requirements of their students, allowing for more tailored instructional strategies. While there are challenges to be addressed, such as data privacy and algorithmic bias, the

opportunities for the development and application of AI in education are indeed promising. Furthermore, the integration of AI can enhance collaboration among educators, students, and technology developers, leading to innovative solutions that cater to individual learning styles. With the right approach and ongoing support, AI can serve as a powerful tool to improve learning outcomes and create a more equitable and inclusive educational landscape for all students. Ultimately, embracing AI in education not only prepares students for future challenges but also ensures that every learner has the opportunity to succeed.

REFERENCES

[1] J. Zhang and Z. Zhang, "AI in teacher education: Unlocking new dimensions in teaching support, inclusive learning, and digital literacy," *J. Comput. Assist. Learn.*, vol. 40, no. 4, pp. 1871–1885, 2024. doi: 10.1111/jcal.12988.

[2] H. Munir, B. Vogel, and A. Jacobsson, "Artificial intelligence and machine learning approaches in digital education: A systematic revision," *Information*, vol. 13, no. 4, p. 203, 2022. doi: 10.3390/info13040203.

[3] J. Jungjohann and M. Gebhardt, "Dimensions of classroom-based assessments in inclusive education," *Int. J. Spec. Educ.*, vol. 38, no. 1, pp. 131–144, 2023. doi: 10.52291/ijse.2023.38.12.

[4] M. Melekoğlu, A. Ak, S. Kaya, and M. Ballıoğlu, "Response to intervention: What do elementary school teachers of students with specific learning disabilities in inclusive classrooms in Türkiye know?," *Psycho-Educ. Res. Rev.*, vol. 12, no. 1, 2023. doi: 10.52963/perr_biruni_v12.n1.10.

[5] M. Wakuru, "Primary school teachers' pedagogical practices and inclusive education: A case of pupils with moderate deafblindness in Tanzania," *JAET*, vol. 24, no. 1, pp. 183–207, 2022. doi: 10.61408/jaet2022v24i01.05.

[6] E. Karagianni and A. Drigas, "New technologies for inclusive learning for students with special educational needs," *Int. J. Online Biomed. Eng.*, vol. 19, no. 05, pp. 4–21, 2023. doi: 10.3991/ijoe.v19i05.36417.

[7] X. Garcia-Vallès, M. Martín, J. Gavaldá, and A. Romero, "Students' perceptions of teacher training for inclusive and sustainable education: From university classrooms to school practices," *Sustainability*, vol. 16, no. 10, p. 4037, 2024. doi: 10.3390/su16104037.

[8] P. Sánchez, R. Rodríguez, S. García, and C. García, "Perceptions of the educational community on the inclusion and presence of students with SEN in mainstream schools: A mixed study," *Children*, vol. 9, no. 6, p. 886, 2022. doi: 10.3390/children9060886.

[9] J. Li, Z. Fei, and J. Chen, "Teaching students with disabilities in Chinese regular education classrooms: Outcomes and influential factors," *ECNU Rev. Educ.*, 2024. doi: 10.1177/20965311241256356.

[10] F. Balık and Ö. Özgün, "Inclusive education in early childhood: Teacher perceptions, practices, challenges and needs," *Ulus. Anadolu Sos. Bilim. Derg.*, vol. 8, no. 2, pp. 487–506, 2024. doi: 10.47525/ulasbid.1479155.

[11] O. Moon, "Teachers' readiness and teaching performance in inclusive education: Their relationship to the implementation of inclusive education program," *AIDE Interdiscip. Res. J.*, vol. 6, pp. 65–110, 2023. doi: 10.56648/aide-irj.v6i1.94.

[12] O. Aktan, "Determination of educational needs of teachers regarding the education of inclusive students with learning disability," *Int. J. Contemp. Educ. Res.*, vol. 7, no. 1, pp. 149–164, 2022. doi: 10.33200/ijcer.638362.

[13] A. Pillai and K. Devamanokari, "Academic assessment by general educators in inclusive schools on special needs," *Int. J. Sci. Res. Arch.*, vol. 8, no. 1, pp. 459–464, 2023. doi: 10.30574/ijsra.2023.8.1.0090.

[14] S. D'Angelo and N. Singal, "Inclusive education in the Dominican Republic: Teachers' perceptions of and practices towards students with diverse learning needs," *Front. Educ.*, vol. 9, 2024. doi: 10.3389/feduc.2024.1387110.

[15] M. Irvan, M. Jauhari, A. Junaidi, L. Badiah, and A. Idhartono, "Involvement of teachers in inclusive schools for quality learning design and quality student learning," *J. Learn. Dev.*, vol. 10, no. 3, pp. 361–375, 2023. doi: 10.56059/jl4d.v10i3.729.

[16] S. Lutz, A. Frey, A. Rank, and M. Gebhardt, "InClass – an instrument to assess classroom management in inclusive and special education with a focus on heterogeneous learning groups," *Front. Educ.*, vol. 9, 2024. doi: 10.3389/feduc.2024.1316059.

[17] K. Kalapala and P. Patel, "A systematic review on digital literacy using machine learning approaches," *Int. Res. J. Adv. Eng. Manage.*, vol. 2, no. 11, pp. 3304–3311, 2024. doi: 10.47392/irjaem.2024.0488.

[18] M. Carvalho, J. Cruz, H. Azevedo, and H. Fonseca, "Measuring inclusive education in Portuguese schools: Adaptation and validation of a questionnaire," *Front. Educ.*, vol. 7, 2022. doi: 10.3389/feduc.2022.812013.

[19] M. Figueiredo, O. Coelho, and A. Veiga, "Inclusive education in Portuguese higher education: A study on the conceptual (in)definition of students in institutional documents," *Educ. Sci.*, vol. 14, no. 6, p. 572, 2024. doi: 10.3390/educsci14060572.
[20] A. Bessarab, I. Antonenko, A. Turubarova, V. Smoliak, and O. Morenko, "Inclusive education:," *Cad. Educ. Tecnol. Soc.*, vol. 16, no. se2, pp. 165–177, 2024. doi: 10.14571/brajets.v16.nse2.165-177.
[21] T. Mofield, R. Prasetyo, and S. Tsujimoto, "Teaching strategies for children with disabilities in Melbourne, Australia," *J. Educ.*, vol. 6, no. 4, pp. 1–13, 2023. doi: 10.53819/81018102t5252.
[22] G. Hook, "Meeting the principles of inclusion in mainstream education for students with Autism/Takiwātanga in Aotearoa: A scoping review," *Teach. Curric.*, vol. 23, no. 1, 2023. doi: 10.15663/tandc.v23i1.421.
[23] M. Gebhardt, M. Schurig, S. Suggate, D. Scheer, and D. Capovilla, "Social, systemic, individual-medical or cultural? Questionnaire on the concepts of disability among teacher education students," *Front. Educ.*, vol. 6, 2022. doi: 10.3389/feduc.2021.701987.
[24] A. Alsolami and M. Vaughan, "Teacher attitudes toward inclusion of students with disabilities in Jeddah elementary schools," *PLoS ONE*, vol. 18, no. 1, p. e0279068, 2023. doi: 10.1371/journal.pone.0279068.
[25] M. Subarna, N. Masud, J. Mensah, S. San, M. Hasan, and J. Tania, "Teaching strategies for students with disabilities in regular classes," *Creat. Educ.*, vol. 13, no. 06, pp. 1843–1861, 2022. doi: 10.4236/ce.2022.136116.
[26] J. Lenkeit, S. Bosse, M. Knigge, A. Hartmann, A. Ehlert, and N. Spörer, "Social referencing processes in inclusive classrooms—Relationships between teachers' attitudes, students' attitudes, social integration and classroom climate," *J. Res. Spec. Educ. Needs*, vol. 24, no. 4, pp. 1190–1205, 2024. doi: 10.1111/1471-3802.12703.
[27] S. Chowdhury, "Developing a sustainable education protocol for children with attention deficit hyperactivity disorder (ADHD) in the context of developing country," *J. Sci. Learn. Innov.*, vol. 1, no. 1, pp. 90–106, 2024. doi: 10.1163/29497736-bja00005.
[28] M. R. Wayahdi, F. Ruziq, and S. H. N. Ginting, "AI APPROACH TO PREDICT STUDENT PERFORMANCE (CASE STUDY: BATTUTA UNIVERSITY)", *Journal of Science and Social Research*, vol. 7, no. 4, pp. 1800-1807, 2024.