

Intelligence and Early Childhood Care in Nigeria: Challenges and Gaps

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Abstract

This study explores the potential applications and implications of Artificial Intelligence (AI) in early childhood care within the Nigerian context. AI tools are becoming increasingly popular for analyzing and addressing issues in various industries, including early childhood care. In the case of Nigeria, a country facing numerous challenges and gaps in this area, artificial intelligence can play a crucial role in identifying and addressing these issues. One of the most significant challenges in early childhood care in Nigeria is lack of access to quality education and healthcare. This information can then be used to prioritize resource allocation and ensure that children in the most vulnerable areas receive the necessary support. Moreover, AI tools can also be used to predict and prevent potential health issues in children. In conclusion, artificial intelligence can play a significant role in addressing challenges and filling gaps in early childhood care in Nigeria. The AI tool will also be able to update its analysis as new data becomes available, ensuring that the report is always up-to-date and accurate. Its advanced capabilities will save time and resources for stakeholders in the field, allowing them to make informed decisions and implement effective strategies for the betterment of early childhood care in Nigeria. The study suggests among others that AI should be used in educating early childhood learners for unique insights from a developing country perspective.

Keywords: Artificial Intelligence, Early Childhood Care, Stakeholder, Innovation

Introduction

In recent years, the rapid advancement of Artificial Intelligence (AI) has sparked discussions about its potential applications across various sectors. One area of particular interest is early childhood care, where AI technologies could potentially revolutionize how we approach education, health monitoring, and administrative tasks. Artificial Intelligence (AI) has evolved significantly since its inception in the 1950s. Artificial intelligence is a branch of Computer science that is concerned with the design of intelligent devices that displays features or characteristics related with Human intelligence. Artificial intelligence can simply be defined as designing machines to make them behave like humans, i.e., reason and process. They have the power to go as far as spatial processing; language processing and even image processing. AI in decision support systems has gained traction across various industries. These systems use AI algorithms to analyze complex data sets and provide insights to aid human decision-making. In healthcare, for instance, AI-powered systems are being used to assist in diagnosis and treatment planning (Topol, 2019). In finance, AI algorithms are employed for fraud detection, risk assessment, and algorithmic trading.

Today, AI is broadly understood as the development of computer systems capable of performing tasks that typically require human intelligence (Russell & Norvig, 2020). These tasks include visual perception, speech recognition, decision-making, and language translation. The field has seen rapid advancements in recent years, driven by increases in computational power, the availability of big data, and breakthroughs in machine learning algorithms. Machine Learning (ML), a subset of AI, has become a cornerstone of modern AI technologies. ML algorithms enable systems to improve their performance on a specific task through experience, without being explicitly programmed (Mitchell, 1997). Deep Learning, a subset of ML, has gained prominence. Based on artificial neural networks inspired by the human brain, deep learning has achieved remarkable results in areas such as image and speech recognition, natural language processing, and game playing (LeCun *et. al.*, 2015).

Natural Language Processing (NLP) represents another significant area of AI development. NLP focuses on the interaction between computers and human language, enabling machines to understand, interpret, and generate human language in a valuable way. Recent advancements in NLP, particularly with the development of transformer models like BERT and GPT, have led to significant improvements in machine translation, sentiment analysis, and text generation (Devlin *et. al.*, 2018). Computer Vision is another field that has seen remarkable

progress due to AI. This technology enables machines to gain high-level understanding from digital images or videos. Applications range from facial recognition and autonomous vehicles to medical image analysis. The development of Convolutional Neural Networks (CNNs) has been particularly influential in this domain (Krizhevsky, *et. al.*, 2012). Robotics and AI have become increasingly intertwined, leading to the development of intelligent robots capable of learning and adapting to their environment. This convergence has applications in manufacturing, healthcare, and even space exploration. Reinforcement learning, a type of machine learning where agents learn to make decisions by taking actions in an environment, has been particularly useful in robotics (Kober *et. al.*, 2013).

The concept of Explainable AI (XAI) has emerged as a crucial area of research and development. As AI systems become more complex and are deployed in critical applications, there's a growing need for these systems to be transparent and interpretable. XAI aims to create AI models that can explain their decisions in ways that humans can understand, which is particularly important in fields like healthcare and criminal justice (Gunning & Aha, 2019). Ethical AI has become a significant focus as the societal implications of AI become more apparent. Researchers and policymakers are grappling with issues such as bias in AI systems, privacy concerns, and the potential impact of AI on employment. There's a growing consensus on the need for responsible AI development that considers these ethical implications (Floridiet. *al.*, 2018).

The integration of AI with other emerging technologies like the Internet of Things (IoT) and blockchain is opening new possibilities. AI can process and analyze the vast amounts of data generated by IoT devices, while blockchain can provide a secure and transparent way to store and share AI models and data. This convergence is expected to drive innovations in areas like smart cities, supply chain management, and personalized healthcare (Xu *et. al.*, 2019).

Despite these advancements, it's important to note that current AI technologies are still considered "narrow" or "weak" AI, designed to perform specific tasks. The concept of Artificial General Intelligence (AGI) – AI that can match or exceed human intelligence across a wide range of cognitive tasks – remains a long-term goal. While there's ongoing research in this direction, most experts believe that AGI is still many years, if not decades, away (Goertzel & Pennachin, 2007). Enhanced Learning Experiences: AI technologies could provide personalized learning paths, interactive educational contents, and adaptive assessments to support children's cognitive development. Improved Health Monitoring: AI-powered tools could assist in early detection of developmental issues, track children's health metrics, and provide timely alerts to caregivers and healthcare providers. Streamlined Administrative Tasks: AI could automate routine administrative processes, allowing childcare professionals to focus more on direct interactions with children.

AI in Early Childhood Education

Artificial Intelligence has penetrated and influenced growth in education through the invention of educational applications, web searches and several learning platforms with several features they can perform. Based on the branches of AI explained above, the below examples are AI in education categorized under these branches.

Expert system- Educational AI's that function like this include Intelligent Virtual Reality.

A few examples under this category include:

ChatGPT: is a chatbot launched by OpenAI, it is built on a GPT-3 which has a large language model, it is also finetuned (an approach to transfer learning) with both supervised and reinforcement learning techniques.

Teal: is a one place to organize & manage your job search. It's like having your own personal ATS or CRM for the job search. Calendly- streamline scheduling and eliminate 'back & forth'. It increases the likelihood of getting a meeting booked with someone

ResyMatch: match your resume with any job description to increase your chances of landing an interview. Machine Vision- Examples of AI's that have the capacity to carry out these features include Automated facial recognition and Gradescope. Natural Language processing- Examples of Educational AI's categorized under this branch include Presentation translator- has features that lets you add live subtitles to your presentations in PowerPoint, as you are speaking. Presentation Translator can display subtitles directly on your PowerPoint presentation in any one of more than 60 supported text languages. This feature can also be used for

audiences who are deaf or hard of hearing.

Grammarly: This is an artificial intelligence-based solution that help user with correct grammar usage. Grammarly goes well beyond the standard word processor grammar and spelling checks. Instead of simply flagging glaring errors, Grammarly can also offer style and usage suggestions. It helps users finetune their writing style to fit into the context to which their writing is targeted. It also helps present idea in a simpler yet communicating.

Twitter Bot: a twitter bot is a type of software bot that controls a twitter account via the Twitter API. This software bot can autonomously perform actions such as tweeting, re-tweeting, liking, following, unfollowing, or direct messaging other accounts. Proper usage includes broadcasting helpful information, automatically generating interesting or creative content, and automatically replying to users via direct message.

Speeko: can help user practice interviewing with an AI speech coach. Also helps user get better at public speaking

Robotics: some educational AI's that have the functions to perform like a robot are Padlet and smartboards.

Machine learning- Educational AI's that function like this include

Turn-it-in: is an Internet-based plagiarism detection carrier run through the American enterprise Turnitin, LLC, a subsidiary of Advance Publications. Founded in 1998, it sells its licenses to universities and high colleges who then use the software as a service (SaaS) website to test submitted documents towards its database and the content of other web sites with the goal of figuring out plagiarism. Results can become aware of similarities with present sources and can also be used in formative evaluation to assist students examine to avoid plagiarism and improve their writing. Turnitin, LLC additionally runs the informational internet site plagiarism.org and presents a comparable plagiarism-detection carrier for newspaper editors and book and magazine publishers referred to as authenticate. Other tools covered with the Turnitin suite are GradeMark (online grading and corrective feedback) and PeerMark (student peer-review service).

Research gate: is a social networking site for scientists and researchersto share papers, ask and answer questions, and find collaborators.

Scopus: Scopus uniquely combines a comprehensive, expertly curated abstract and citation database with enriched data and linked scholarly literature across a wide variety of disciplines.

Scopus quickly finds relevant and authoritative research, identifies experts and provides access to reliable data, metrics and analytical tools. Be confident in progressing research, teaching or research direction and priorities — all from one database and with one subscription.

Gooru: Gooru is an online "GPS for learning" tool for material exploration, which allows the instructor dashboard includes a number of choices for quickly gauging student progress. Gooru compiles data from many sources and applies AI to calculate traits across various dimensions, including knowledge, mindsets, and talents.

Web of science- is a paid-access platform that provides access to multiple databases that provide reference and citation data from academic journals, conference proceedings, and other documents in various academic disciplines.

Challenges and Concerns

Recent systematic reviews show that AI in Education has been a field of research concentrated in developed countries (Roll & Wylie, 2016). AI in Education is a topic that is under-discussed in the developing world but is an important component of a discussion about advanced technology that is built upon well-established infrastructure and knowledge ecosystems.

This presentation seeks to bring the conversation to the least developed and emerging nations, recognizing the many obstacles these nations must overcome while illuminating the need for structural innovation to advance education as a human right on a large scale in new learning scenarios.

This section of this presentation explains some challenges regarding the incorporation of AI in education as a

way to improve the equity and quality of learning and to promote education. It answers a part of the title of this presentation namely, AI in Education:

Challenges and Solution

The fear of AI replacing humans in their various fields: Every new technology just like Artificial intelligence assures in some good benefits and some grave risks. Over the years, of the major challenges of AI is the fear it will replace humans and make many people lose their jobs in future. There are different schools of thought about this feeling. And these set of people with this phobia can be categorized into the following

The Dystopians: The dystopian school of thought believes that humans and machines will go through a darwinian battle which will be won by intelligent machines. The dystopians see primarily the negative implications of AI and robotics. They envision that robots will take on repetitive tasks which are monotonous for people and necessitates little intelligence. On the other hand, the AI will be able to take on jobs which need high intelligence.

The Sceptics: Their affirmation is that the productivity growth will not result in growth of profit or national GDPs especially in the context of aging populations and income inequality. The sceptics believe that turnover growth does not necessarily mean growth in benefit. They are also calling for more lucidity because they believe that the productivity growth will not be at the expected level and this may lead to a stagnant economy or even loss compared to the investments made in AI.

Privacy Issue: As AI continues to grow, several organizations have committed to ethical standards to raise the importance of data protection and data privacy. These privacy concerns have been aggravated due to the AI capability to scale and automate everything at high-speed and due to the fact that especially young people (the majority of students) are not even aware or interested to know how much data their devices are shared for free. In this new context, people become vulnerable to data exploitation by identification, tracking and monitoring their entire lives, not just their education path.

This simply makes it possible for your personal data to become a part of a large data set after being anonymized. AI is capable of de-anonymizing this data based on inferences from other devices. AI can utilize sophisticated machine learning algorithms to infer or predict sensitive information from non-sensitive forms of data. For instance, someone's keyboard typing patterns can be utilized to know their emotional states such as nervousness, confidence, sadness, and anxiety. Even more alarming, a person's political views, ethnic identity, sexual orientation, and even overall health can also be determined from data such as location and activity.

Digital Divide: Although AI has opened numerous possibilities, it has also been a disruptive technology and may worsen the existing inequalities and divides as the marginalised and disadvantaged population are more likely to be excluded from AI-powered education. AI is capable of worsening digital divide in our society and this will put a wider gap in between developed education areas and education less developed area.

Poor Data system: The quality of any AI-enabled system is directly proportional to its database. A fully functional data analytics system with comprehensive and up-to-date data opens possibilities for AI-enabled predictive and machine learning algorithms. Without the needed data, no sort of algorithm, no matter how sophisticated, can function properly. However, data availability is a necessity but currently in an insufficient condition. After all, inaccurate data are likely to make machine learning algorithms generate incorrect outputs. Indeed, predictive algorithms can only make complete and accurate predictions if the data they are handling are complete and accurate. However, a lot of nations still have trouble gathering fundamental but important educational statistics. The UNESCO Institute for Statistics (UIS) lists numerous obstacles to effective statistical and effective data gathering, use, and analysis of educational data (UIS, 2018b). At the school level, educational data should be accessible and usable. In addition to being able to aggregate data to highlight trends that might guide policy development, a functioning data system should be able to produce studies that are detailed enough to aid educators in understanding the major problems.

Furthermore, data must also account for inequities, providing insights, for example, on learning outcomes disaggregated according to demographic factors such as age, gender and socio-economic background (UNESCO, 2018). Education systems can identify the educational disadvantage that marginalized or

disadvantaged communities face by producing such evaluations. However, information on underprivileged populations still has a history of being spotty or nonexistent. For instance, a 2016 UNICEF study found that, of the 40 countries surveyed, 19 lacked any information at all on children with disabilities. In many of the countries that did have data, the information only mentioned the child's participation in a special needs program without mentioning the nature of the child's disability. Despite the potential benefits, stakeholders expressed several apprehensions.

Data Privacy: There are concerns about the collection, storage, and use of sensitive data related to young children.

Digital Divide: The uneven access to technology and internet connectivity across Nigeria could exacerbate existing inequalities in early childhood care. **Loss of Human Touch:** Some stakeholders worried that over-reliance on AI might reduce essential human interactions crucial for children's social and emotional development.

Knowledge Gap

A significant finding of the study was the considerable knowledge gap among stakeholders regarding AI capabilities and limitations. This highlights the need for educational initiatives to inform decision-makers, educators, and parents about AI technologies and their potential applications in early childhood care. Stakeholders and policy makers who design policies in AI in education are meant to ask some key questions when preparing these policies.

Conclusion

Artificial Intelligence (AI) presents transformative potential in early childhood care, offering opportunities for personalized learning, improved health monitoring, and streamlined administrative tasks. However, significant challenges exist, including a substantial knowledge gap among stakeholders regarding AI capabilities, concerns about data privacy and the digital divide, and apprehensions about the potential loss of essential human interactions in childcare. The effectiveness of AI systems is heavily dependent on data quality, which remains a challenge in many nations, particularly in the developing world. Moreover, as AI becomes more prevalent in education, ethical considerations such as bias in AI systems and the potential impact on employment need careful attention.

Suggestions

To harness the benefits of AI in early childhood care while mitigating risks, several key actions are recommended. These include developing AI literacy programs for stakeholders, implementing strategies to ensure equitable access to AI technologies, establishing robust data protection measures, and maintaining a human-centered approach in care and education. There's a need to improve data systems, develop contextually relevant AI solutions, and establish clear ethical guidelines for AI use in early childhood settings. Promoting research into the long-term impacts of AI on child development, fostering collaboration between technologists, educators, and child development experts, and implementing systems for continuous evaluation of AI technologies in childcare settings are also crucial. By addressing these recommendations, stakeholders can work towards an inclusive, ethical, and effective integration of AI that truly benefits the development and well-being of all children.

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