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AI Assisted Qur'anic Memorization In Nigeria

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Abstract
Artificial Intelligence (AI) is increasingly being applied in educational and religious contexts worldwide. In Nigeria, AI-assisted Qur'anic memorization represents a pioneering intersection between tradition and technology. This paper examines the adoption, challenges, and opportunities of AI tools in aiding Qur'anic memorization (ḥifẓ) in Nigeria. It highlights local and international technologies, case studies of implementation, and comparative insights from other Muslim-majority countries. The paper also addresses infrastructural, ethical, and pedagogical challenges, concluding with recommendations for equitable integration of AI in Islamic education. Material is provided from both primary and secondary sources.

Key words: *AI, Qur'an, Al-majiri, Tsangaya, Islamiyyah, Technology, and Memorization*

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I. Introduction

Qur'anic memorization, or ḥifẓ, has been a core feature of Islamic scholarship for centuries, particularly in Nigeria, where millions attend Islamiyya, Tsangaya, and Almajiri institutions. Traditionally, this sacred process is oral, relying on repetition with a teacher (ustādh). Because Nigerians are religious by nature and often adhere to the teachings of the Qur'an and the Hadith-which consistently emphasize the recitation of the Qur'an-they have adopted the saying of Allah:

چ ٹ ٹ ڈ ڈ چ المزمل: ٤

''...and recite the Qur'an with measured recitation.''(Musammil:4).

This verse was further expatiated by the Prophet (SAW) when he says:

"أقرأوا القرآن، فإنه يأتي يوم القيامة شفيعا لأصحابه."

''Read the Qur'an for it will come on the Day of resurrection as an intercessor for its companions.'' (Muslim: 804)

However, advances in Artificial Intelligence (AI), especially in natural language processing (NLP) and voice recognition, have begun transforming educational systems globally—including Qur'anic learning (Khan 48).

In Nigeria, the proliferation of smartphones and increasing digital literacy create new opportunities for AI to supplement traditional Islamic education. Apps that provide real-time feedback on recitation accuracy, suggest corrections, and track memorization progress are now being used by learners and teachers alike (Ibrahim 57). This essay explores how these tools are currently being adopted, the challenges that limit their spread, and how Nigeria compares with other countries using AI for ḥifẓ.

II. Background And Context

Nigeria boasts one of the highest numbers of Qur'an memorizers worldwide (Yusha'u 410). In the northern regions, ḥifẓ is typically conducted through oral transmission in informal schools, often without formal evaluation mechanisms. These schools—though rich in spiritual content—are often under-resourced, making technology integration both a necessity and a challenge (Adamu and Ibrahim 121).

The oral transmission of the Qur'an is an ancient tradition and remains the most effective method of learning, in line with the Qur'an and tradition of the Prophet (SAW), the Qur'an says:

چ ئي بج بح بخ بم چ القيامة: ١٨

''So, when we have recited it (through Gabriel), then follow its recitation.''(Al-Qiyamah:18).

The Angel Gabriel taught the Prophet Muhammad (SAW) the Qur'an through recitation. Gabriel would reveal the verses to the Prophet, who would reveal then recite them back, memorizing them and later reciting them to others. This process, repeated over time, led to the complete memorization of the Qur'an. This process

was specially repeated during Ramadhan and in the year of the Prophet's death, this review was doubled, with Gabriel reviewing the Qur'an with him twice. (Islamic city:1995).

AI offers a modern supplement to these systems. For example, apps like Tarteel and Quran Companion use AI-driven voice recognition to help correct errors in Tajwīd. This supports students who may lack close access to trained teachers, allowing them to receive instant feedback (Rahman 94).

III. Case Studies From Nigeria

Tarteel Use in Abuja and Kano:

In Abuja, private Islamic schools use the Tarteel app to assist students in Tajwīd correction. Teachers report improved memorization efficiency and engagement (Salihu and Abdulqadir 33).

AI Hifz Circles in Lagos:

In Lagos, well-to-do Muslim parents have introduced ḥifẓ circles where their children use AI-supported apps in addition to physical classes. One parent noted, "The app catches what even I missed while listening" (Othman 120).

Integration in Higher Institutions:

At Ahmadu Bello University (ABU), students in Islamic Studies are using AI to assess phonetic consistency in Tajwīd as part of their postgraduate research (Ahmed 309). This has encouraged a scholarly interest in the intersection of Islamic pedagogy and computational linguistics.

IV. Opportunities In The Nigerian Context

AI-assisted Qur'anic learning offers many advantages in Nigeria:

- Access for Remote Learners: Students in underserved or conflict-ridden regions can engage in ḥifẓ without relocating (Ibrahim 60). It will also confine the youth in an ideal environment instead being use for violence and other social vices. A. S. Muhammad (2016) observed:

The terrorism is the result of failure in conflict resolution which can occur anywhere in the world. It is the crucial social problem of the society as well. The generally classified and unified roles of civil society in order to preventing and reducing of terrorism are to engaged the youth as follows: - a. Counseling and Educational and the ultimate education is learning the Qur'an…''b. Community Services. c. Sponsorship and Research.

- Standardization of Recitation: Nigeria's multilingual context can affect pronunciation. AI can help standardize Tajwīd across ethnic groups (Khan 52). Just as Umar Bin Al-Khattaab did when the Ummah faced conflict over differences in Qur'anic recitation, he took steps to standardize the recitation in the dialect of Quraysh. A.S. Muhammad (2016)

In many Muslim households, Islam is taught to children in isolation of other concepts and values, and we rely far too heavily on the four hours of Sunday school to teach our children an ample amount of information. We also begin teaching basic Islamic values to children too late with regard to their age, and often we may not be teaching them the Qur'an in standard method which they need to grow into happy and practicing Muslims and human beings. (A.S. Muhammad 2016)

- Self-Paced Learning: Learners can study any time, enhancing retention (Rahman 95).
- Support for Disabled Learners: Visual and auditory AI tools help learners with disabilities engage effectively in Qur'anic study (Ahmed 314).

V. AI Technologies And Their Accuracy

Modern AI tools for Qur'an learning rely on large datasets of recitations and deep learning models. Tarteel, for instance, uses voice recognition and supervised learning to detect Tajwīd mistakes (Khan 49). These systems assess word accuracy, track recitation fluency, and suggest improvements in real time.

Despite occasional inaccuracies, AI tools can supplement the role of human teachers, particularly in detecting frequent errors and facilitating revision sessions (Salihu and Abdulqadir 35).

VI. AI Technologies And Accuracy

Artificial Intelligence technologies used in Qur'anic memorization rely heavily on advancements in speech recognition, deep learning, and natural language processing (NLP). At the core of these technologies are models trained to recognize and evaluate Qur'anic recitation for correctness in pronunciation, rhythm, and adherence to tajwīd rules.

AI Models and Performance Metrics

Several studies have demonstrated the effectiveness of AI in modeling Qur'anic recitation. A prominent approach involves the use of Mel Frequency Cepstral Coefficients (MFCC) for speech feature extraction, combined with Long Short-Term Memory (LSTM) networks to analyze pronunciation accuracy. Al Harere and Al Jallad (2023) developed a deep-learning model that achieved 96% accuracy in detecting mispronunciations of tajwīd rules such as ghunnah, idghām, and iqlāb, using the QDAT dataset (Al Harere & Al Jallad, 2023).

Another noteworthy advancement is the application of EfficientNet convolutional neural networks for tajwīd rule classification, as shown in a 2025 study by Shaiakhmetov et al., which reported 95–99% accuracy across different tajwīd categories (Shaiakhmetov et al., 2025). These models rely on labeled datasets of correct and incorrect recitations to fine-tune their performance.

Additionally, end-to-end speech recognition systems, such as the one proposed by Harere & Jallad (2023), utilize GRU-based deep learning architectures and achieve Word Error Rates (WER) as low as 8.34%, and Character Error Rates (CER) around 2.4%, demonstrating near-human performance in recognizing Qur'anic recitation (Harere & Jallad, 2023).

Limitations in the Nigerian Context

Despite their impressive performance in lab settings, these technologies face several limitations when applied in Nigeria. One major challenge is the lack of localized datasets—most AI models are trained on standard Arabic recitation, often in Gulf or Egyptian accents. This poses challenges for Nigerian users whose pronunciation may reflect regional linguistic influences, including Hausa, Yoruba, and Kanuri speech patterns. Consequently, the feedback provided by AI apps may not always align with local expectations, potentially demotivating learners.

Moreover, while apps such as Tarteel AI and TajweedMate are effective in evaluating memorization, their reliance on continuous internet access and high RAM usage can hinder adoption in areas with poor connectivity or lower-end devices. These issues highlight the need for Nigeria-specific adaptation of AI Qur'anic tools, including offline support and accent-tolerant training models.

VII. Challenges And Ethical Concerns

Several challenges hinder widespread adoption of AI in Qur'anic learning:

- Digital Divide: Rural communities often lack stable electricity, smartphones, or internet access (Adamu and Ibrahim 125).
- Model Accuracy: Some apps incorrectly flag correct recitations due to dialectical variation (Rahman 96).
- Scepticisms from Scholars: Some traditionalists worry that reliance on AI reduces the role of the teacher and the spiritual connection of oral learning (Yusha'u 419).
- Data Privacy: AI apps record voices, raising concerns about data protection and potential misuse (Othman 124).

Challenges and Ethical Considerations

While the use of AI in Qur'anic memorization holds great promise, it also introduces a range of challenges—technical, infrastructural, cultural, and theological—that must be addressed to ensure sustainable and ethical integration.

Infrastructure and Access

One of the primary barriers to widespread adoption of AI memorization tools in Nigeria is technological infrastructure. In many rural areas, basic amenities such as electricity and internet access remain unreliable. According to Adamu and Ibrahim (2021), only about 35% of Nigerian households have access to consistent power, and digital literacy remains low in many Qur'anic schools (Adamu & Ibrahim, 2021).

These conditions mean that even when AI tools are technically available, many students cannot use them consistently. Moreover, most popular apps require smartphones with recent operating systems and stable network connections—resources not readily available to many Qur'anic students in northern Nigeria or among the urban poor.

Theological and Cultural Concerns

There is also debate among Islamic scholars over the permissibility and appropriateness of using AI in Qur'anic education. Some question whether the spiritual dimensions of Hifz—such as barakah (blessing) from learning directly from a teacher—can be preserved through digital tools. Others raise concerns about algorithmic errors or misinterpretation of sacred text due to unverified models.

However, contemporary Islamic scholars and educators, including those contributing to the Islamic Ethics and AI conference in Kuala Lumpur (2023), have argued that AI is permissible when used as a tool rather than a replacement for human guidance, and provided it adheres to Islamic ethical frameworks such as the Maqāṣid al-Sharī'ah (objectives of Islamic law) (Zuhri et al., 2024).

Gender Inclusion and Privacy

In many Nigerian communities, female participation in Qur'anic memorization is hindered by social expectations and limited mobility. AI-assisted learning can help overcome these challenges by allowing female students to memorize the Qur'an privately, at home, and at their own pace. As noted by Hussain-Abubakar (2024), female learners in Ilorin identified digital tools as a possible enabler for expanding access to memorization opportunities without compromising cultural norms (Hussain-Abubakar, 2024).

Nonetheless, there is a need to ensure that AI applications respect user privacy, especially for female users, by incorporating password protection, minimal data sharing, and offline functionality.

VIII. Comparative Insights: International Models

Several Muslim-majority countries have made significant progress in integrating AI into Qur'anic education, offering useful lessons for Nigeria.

Malaysia

Malaysia's j-QAF program, implemented since 2005, integrates Qur'anic memorization into public schools using ICT support. Recent initiatives have incorporated AI apps such as Smart Quran and MyQuran Cloud, which feature tajwīd detection and real-time correction. These tools are supported by national policy, making them widely available across school systems (Wikipedia: j-QAF Program).

Malaysia: Government-endorsed Qur'anic learning apps incorporate gamification and feedback systems to increase user engagement (Ahmed 310).

Indonesia:

Uses national dashboards to evaluate students' ḥifẓ progress through AI-based analysis (Rahman 98).

Indonesia, been the world's largest Muslim-majority country, has embraced digital Qur'anic learning through platforms such as BeHafizh—a mobile application developed by Gadjah Mada University. This app combines AI speech analysis with gamification, guiding users through memorization with visual tracking and motivational rewards. It also supports multiple local languages, making it widely accessible (BeHafizh Project, 2022).

Saudi Arabia

Saudi Arabia: At the King Fahd Qur'an Complex, research is ongoing to develop tools that measure rhythm and pitch for recitation assessment (Khan 53).

Saudi Arabia, also home to the Haramain (Mecca and Medina), has invested heavily in Qur'anic technologies. Apps like Ayat and Nourania are endorsed by religious authorities and used globally. The government also sponsors AI Qur'an recitation competitions that include digital feedback components.

Nigeria can learn from these countries by integrating AI into formal Islamic education, offering subsidized platforms for low-income learners, and localizing content for better comprehension.

United Kingdom:

Muslim schools use AI to assist children from non-Arabic speaking backgrounds with pronunciation training (Salihu and Abdulqadir 36).

IX. Discussion And Implications

Integrating AI into Qur'anic education in Nigeria presents a path toward democratizing access to sacred knowledge. It allows:

- Wider Outreach: AI tools reach students in remote areas previously cut off from formal ḥifẓ (Ibrahim 63). It will also prevent young and elderly people in engaging in committing minor sins. A. S. Muhammad observed: '' *Personal observations suggest that many Muslims in Kwara State appear comfortable with minor sins, exhibiting a concerning normalization of behaviors such as backbiting (*ghibah*),*'' AI of the Qur'an on the mobile phones can help to overcome such behaviors.
- Improved Teaching Outcomes: Teachers use AI feedback to tailor instruction (Ahmed 312).
- Inclusion: Women and learners with disabilities can benefit from flexible, private learning environments (Othman 125).

However, developers and educators must ensure that AI tools are linguistically accurate, culturally sensitive, and ethically designed to respect the sanctity of Qur'anic education.

The analysis in this paper reveals that AI can significantly improve the effectiveness and reach of Qur'anic memorization efforts in Nigeria. The integration of tools such as Tarteel and Muallim enhances learner autonomy, provides immediate corrective feedback, and allows for structured revision.

However, AI should not be viewed as a replacement for traditional Qur'anic teachers. Rather, it should serve as a complementary tool, especially valuable in reinforcing memorization outside classroom hours. Hybrid models—where AI apps are supervised by human instructors—offer the best path forward.

In addition, policy-level engagement is crucial. National Islamic bodies such as the Supreme Council for Islamic Affairs (SCIA) and the Muslim Students' Society of Nigeria (MSSN) should work with tech developers to ensure AI tools align with Nigeria's educational and spiritual values.

The development of accent-sensitive AI models, offline-capable applications, and multi-language support (Hausa, Yoruba, Fulani, Igbo etc) would ensure that these tools are inclusive and contextually relevant. AI must also be governed by Islamic ethics, data privacy principles, and transparency.

X. Conclusion And Recommendations

AI-assisted Qur'anic memorization offers Nigeria an opportunity to modernize religious education while preserving traditional values. Key recommendations include:

1. Institutional Support: Islamic councils and ministries should fund and endorse AI Qur'anic apps (Adamu and Ibrahim 130).
2. Localization of Tools: Developers must include Nigerian Arabic accents and local languages (Khan 54).
3. Teacher Training: Equip Ustādh with digital skills to use AI effectively in the classroom (Salihu and Abdulqadir 38).
4. Research and Development: Universities should engage in interdisciplinary research on AI and Qur'anic pedagogy (Ahmed 316).

5. Develop localized datasets reflecting Nigerian Arabic recitation styles for more accurate AI feedback.
6. Design offline-compatible AI apps to reach rural learners with limited internet access.
7. Train teachers and imams to integrate AI tools into traditional teaching practices.
8. Engage religious authorities to review, guide, and endorse AI apps to ensure community trust.
9. Promote gender inclusion by supporting private and culturally sensitive use of memorization tools by female learners.

Conclusion:

AI-assisted Qur'anic memorization represents a transformative opportunity for Nigerian Muslims. It has the potential to overcome teacher shortages, reach underserved communities, and support learners in achieving mastery of the Qur'an. Through responsible use of AI, Nigeria can ensure that Qur'anic education remains not only a deeply spiritual practice but also an accessible and innovative one for future generations.

while challenges remain, the path ahead is promising. With careful implementation, AI can help preserve the sacred tradition of Hifz in Nigeria, enhance learning outcomes, and support a new generation of Huffādh empowered by both faith and technology.

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