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PRESERVING AND PEDAGOGIZING NATIONAL MUSIC HERITAGE: AN AI-DRIVEN APPROACH TO KARAKALPAK, UZBEK, AND TURKIC FOLK MUSIC IN MODERN EDUCATION

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Abstract

This thesis explores the application of Artificial Intelligence (AI) for the preservation and pedagogical integration of Karakalpak, Uzbek, and broader Turkic folk music. These rich oral traditions face significant threats from globalization and declining intergenerational transmission. Drawing on a theoretical framework of ethnomusicology, digital humanities, and AI, this research provides a comparative analysis of these musical heritages, highlighting their shared characteristics and unique features. We propose a model for leveraging AI in three key areas: 1) Digitization and Archiving, using AI for audio restoration, automated metadata extraction, and Optical Music Recognition; 2) Analysis and Understanding, employing AI for pattern recognition and comparative musicological studies; and 3) Educational Integration, through AI-powered interactive learning platforms, generative tools for pedagogical purposes, and immersive VR/AR experiences. Case studies for a Digital Archive for Turkic Music, an AI-Powered Learning Module for the Karakalpak Kobyz, and an Uzbek Makom Analysis Tool are presented to illustrate practical implementation. The thesis also addresses the critical challenges and ethical considerations of this interdisciplinary approach, including data bias, authenticity, intellectual property, the digital divide, and cultural sensitivity. We conclude that a culturally informed and ethically responsible integration of AI can ensure the sustainable preservation and dynamic educational revitalization of these invaluable musical traditions for future generations.

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Introduction. The preservation of cultural heritage stands as a critical endeavor in an era marked by rapid globalization and technological advancement. Among the myriad forms of cultural expression, music, particularly folk music, serves as a profound repository of a nation's history, values, and identity. Intangible cultural heritage, such as traditional musical forms, faces unique vulnerabilities, including the erosion of oral traditions, inadequate documentation, and declining intergenerational transmission. This thesis focuses on the rich, yet often underrepresented, folk music traditions of Karakalpakstan, Uzbekistan, and the broader Turkic world, examining their intrinsic value and the urgent need for their safeguarding.

These musical traditions, characterized by their diverse instruments, vocal techniques, narrative forms, and regional variations, are integral to the cultural fabric of their respective communities. However, they are increasingly susceptible to loss due to various socio-economic and cultural pressures. The advent of modern technologies, particularly Artificial Intelligence (AI), offers unprecedented opportunities to address these challenges. AI's capabilities in data processing, pattern recognition, and content generation can revolutionize how folk music is preserved, digitized, analyzed, and integrated into contemporary educational frameworks.

This research aims to explore the transformative potential of AI in the context of Karakalpak, Uzbek, and Turkic folk music. Specifically, it seeks to answer the following research questions:

1.How can AI technologies effectively digitize and preserve the diverse characteristics of Karakalpak, Uzbek, and Turkic folk music?

2.What are the pedagogical implications and methods for integrating AI-preserved folk music into modern education systems?

3.What are the challenges and ethical considerations in applying AI to the preservation and teaching of these musical heritages?

By addressing these questions, this thesis will outline a comprehensive approach to leveraging AI for the sustainable preservation and dynamic pedagogical integration of these invaluable musical traditions, ensuring their continuity and accessibility for future generations. The objectives include providing a comparative analysis of the selected musical traditions, identifying suitable AI

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technologies for their preservation and educational application, and discussing the inherent challenges and ethical dilemmas that must be navigated in this interdisciplinary field.

Theoretical Framework: Ethnomusicology, Digital Humanities, and AI

To effectively address the preservation and pedagogical integration of national music heritage, it is crucial to establish a robust theoretical framework that draws upon ethnomusicology, digital humanities, and the burgeoning field of Artificial Intelligence. Each discipline offers unique perspectives and methodologies vital for a holistic approach.

Ethnomusicology, as the study of music in its cultural context, provides the foundational understanding of the selected folk traditions. It emphasizes the importance of understanding music not merely as sound but as a social practice, interwoven with history, rituals, and community identity. Ethnomusicological research involves fieldwork, documentation of oral traditions, analysis of musical structures, and interpretation of cultural meanings [1]. This discipline is indispensable for identifying what aspects of Karakalpak, Uzbek, and Turkic folk music are most critical to preserve and how their cultural nuances can be respected and accurately represented in digital formats.

Digital Humanities (DH), an interdisciplinary field at the intersection of computing and the humanities, offers the tools and methodologies for applying computational approaches to cultural artifacts. In the context of music heritage, DH facilitates the creation of digital archives, the development of searchable databases, and the use of digital tools for analysis and visualization [2]. The principles of DH guide the process of digitizing musical recordings, transcriptions, and associated ethnographic data, ensuring that these digital assets are accessible, interoperable, and sustainable for long-term preservation and scholarly inquiry.

The integration of Artificial Intelligence (AI) into cultural heritage preservation, particularly music, marks a significant evolution in both ethnomusicology and digital humanities. AI technologies, encompassing machine learning, deep learning, and natural language processing, provide advanced capabilities for processing, analyzing, and even generating musical content. From enhancing

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Website: usajournals.org

audio quality of historical recordings to identifying complex musical patterns and facilitating interactive learning experiences, AI offers innovative solutions that extend beyond traditional digital methods [3]. The application of AI in this domain is not merely about automation but about augmenting human expertise, enabling researchers and educators to uncover new insights and create more engaging ways to interact with musical heritage. This framework thus positions AI as a powerful enabler for both the deep contextual understanding championed by ethnomusicology and the technological accessibility promoted by digital humanities.

Karakalpak, Uzbek, and Turkic Folk Music: A Comparative Analysis

The musical landscapes of Karakalpakstan, Uzbekistan, and the broader Turkic world, while sharing common historical and cultural roots, each possess distinct characteristics that warrant individual attention before a comparative synthesis can be drawn. This section provides an overview of each tradition, highlighting their unique features, key genres, instruments, and current preservation statuses.

Karakalpak Folk Music. Karakalpak folk music is profoundly intertwined with its oral folk arts, showcasing a rich tapestry of influences from both Turkic and Iranian peoples [4]. Central to this tradition are the zhirau (throat singers) and Bakshi (folk singers/storytellers), who perform their works accompanied by national musical instruments. A prominent example is the kobyz, an ancient string bow instrument crafted from horsehair, widely recognized among Turkic communities for its unique structure and evocative sound [5].

Karakalpak musical compositions are generally referred to as kosik, which are narrations of poems or epics set to music. These kosiks are diverse, encompassing ritualistic forms such as lullabies, funeral laments, and wedding songs (synsu, bet ashar, korimlik), as well as love-lyric and historical songs [6]. The thematic content often reflects deep patriotism, national pride, and historical struggles, vividly exemplified in works like Jien-zhirau's "The wandering nation," which recounts the historical migrations and hardships faced by the Karakalpak people [4]. Notable historical figures like Djien-zhirau (1730-1784), Kunkhodzhi (1799-1880), Adzhiniyaz (19th century poet and Bakshi), and Berdakh (considered a

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founder of Karakalpak literature) have significantly shaped this musical heritage through their compositions and performances [4, 6]. The preservation of Karakalpak music largely relies on the continuity of these oral traditions and the efforts to document and digitize existing performances.

Uzbek Folk Music. Uzbek music is characterized by its monodic nature, where even in ensembles, performers often play the same melody with subtle variations, rich ornamentation, micro-intonations, and dynamic shifts [7]. This sophisticated monophony is frequently supported by complex rhythmic patterns known as usuls, typically performed on percussion instruments such as the doira [7]. The instrumental palette of Uzbek music is extensive, featuring bowed string instruments like the ghijak and sato, plucked strings such as the dutar, tanbur, and the UNESCO-recognized rubab, the hammered string instrument chang, and wind instruments including the nay, karnai, and surnai [7].

Regional styles, including Bukhara-Samarkand, Fergana-Tashkent, Khorezm, and Kashkadarya-Surkhandarya, contribute to the diversity of Uzbek musical traditions. Historically, the transmission of this music was predominantly oral, following the ustoz-shogird (master-apprentice) tradition, where aspiring musicians would dedicate years to memorizing vast repertoires. Written notation was introduced later, in the 20th century, though the 19th-century tanbur notation system by Kamil Khorezmi offers an earlier example of transcription [7].

Uzbek musical genres are broadly categorized into folk music (simpler, non-professional songs) and classical music, with the latter epitomized by the makom tradition. Folk songs are further divided into ritualistic forms (e.g., Alla for lullabies, Yor-yor for weddings, Yigi for mourning, Maida for work) and universal types (e.g., terma, ashula, katta ashula, koshuk, lapar, yalla) [7]. Dastans, long narrative poems recounting historical events or heroic deeds, are performed by storytellers known as bahshi (a term also used in Karakalpakstan, where zhirau is more common), sometimes incorporating throat singing and instruments like the dutar, dombra, kobuz, gijak, or doyra [7].

The Makoms represent the zenith of Uzbek classical music, with the Shashmakom (literally “six makoms”), an Uzbek-Tajik tradition, recognized by UNESCO for its intricate structure and historical significance. This suite of six

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Website: usajournals.org

extensive musical cycles, developed around the 18th century, comprises instrumental (muskilot) and vocal (nasr) sections, often featuring poetry from classical Uzbek literary figures [7]. Other significant makom traditions include the Khorezm makoms and the distinct Fergana-Tashkent makom cycle. The preservation of Uzbek music has seen significant progress through recording and digitization efforts in the 20th and 21st centuries, with many forms now available as sheet music and audio files [7].

Broader Turkic Folk Music. Broader Turkic folk music, encompassing traditions from various Turkic-speaking regions, shares a foundational identity influenced by the diverse cultures of Anatolia, Europe, and Asia [8]. A significant historical effort in its preservation was initiated by Mustafa Kemal Atatürk after the foundation of the Turkish Republic in 1923, leading to a wide-scale classification and archiving project that collected over 10,000 folk songs between 1924 and 1953. This initiative also sought to integrate traditional folk music with Western harmony and musical notation to create a more modern national style [8].

Key genres within Turkic folk music include Türkü (folk songs), which are broadly categorized into Kırık havalar (regularly rhythmic melodies) and Uzun havalar (non-rhythmic or irregularly rhythmic melodies) [8]. The instrumental landscape is rich and varied, featuring plucked stringed instruments such as the saz family (including the bağlama and cura) and the kanun, a type of box zither. Bowed stringed instruments like the kabak kemane (gourd fiddle) and the Black Sea Kemançe are also prominent. Wind instruments include the zurna, ney (duduk), sipsi, çifte, kaval, and the tulum (droneless bagpipe). Percussion is provided by instruments like the davul, nağara, tef, darbuka, and kaşık (spoons) [8].

The Ashiks (Turkish Minstrels) played a crucial role in the development and dissemination of Turkic folk music, often accompanying themselves on the saz. Their performances were traditionally monophonic, though some polyphonic elements could emerge when musicians utilized multiple strings of the saz [8]. This rich tradition, with its emphasis on storytelling and diverse instrumentation, provides a broader context for understanding the specific characteristics of

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 07, October, 2025
Website: usajournals.org

Karakalpak and Uzbek folk music, highlighting both shared heritage and regional diversification.

Comparative Synthesis. Upon examining the Karakalpak, Uzbek, and broader Turkic folk music traditions, several commonalities and distinctive features emerge, underscoring their shared heritage while celebrating their unique cultural expressions. A fundamental shared characteristic is the profound connection to oral tradition and storytelling. All three traditions extensively utilize narrative forms, such as the Karakalpak kosik, Uzbek dastans, and Turkic türkü, to convey historical events, epic tales, and cultural values [4, 7, 8]. The role of bards and storytellers, like the Karakalpak zhirau and Bakshi, and Uzbek bahshi (often performing with throat singing), is central to the transmission and performance of these musical narratives across all regions [4, 7].

Monophony is another significant commonality, particularly evident in Uzbek music, where melodies are performed in unison, often with intricate ornamentation rather than harmonic complexity [7]. While Turkish folk music also emphasizes melodic lines, some polyphonic elements can be observed in the use of instruments like the saz [8]. The instrumental families also show overlap; stringed instruments such as the saz (bağlama, cura), dutar, and kobyz (a string bow instrument common in Karakalpakstan and among Turkic peoples) are prevalent, as are various wind instruments like the ney and percussion instruments like the doira and davul [4, 7, 8]. This shared instrumental heritage points to a common ancestral musical landscape.

However, distinct regional variations and specialized forms differentiate these traditions. Uzbek music, for instance, is highly distinguished by its sophisticated makom tradition, particularly the UNESCO-recognized Shashmakom, which represents a pinnacle of classical modal music with complex structures and vocal sections featuring classical poetry [7]. While elements of modal systems are present in broader Turkic music (e.g., ayak in Turkish folk music), the formalized and extensive makom cycles are a defining feature of Uzbek classical music. Karakalpak music, while sharing the Bakshi tradition with Uzbeks, places a unique emphasis on the zhirau throat singing and the kobyz as its primary accompaniment [4]. Broader Turkic folk music, as exemplified by Turkish

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Volume 01, Issue 07, October, 2025
Website: usajournals.org

traditions, features a wide array of rhythmic structures (e.g., Kırık havalar and Uzun havalar) and a rich history of state-led archiving and modernization efforts, which have integrated Western notation and harmonies [8].

In summary, while all three traditions are deeply rooted in oral transmission, narrative forms, and a shared palette of instruments, they diverge in their specific genre developments, the prominence of certain vocal techniques (like throat singing), and the formalization of classical structures such as the makom. Understanding these shared foundations and unique expressions is crucial for developing AI-driven preservation and educational strategies that are culturally sensitive and effective.

AI Technologies for Music Heritage Preservation and Education

The application of Artificial Intelligence (AI) offers transformative potential for the preservation, analysis, and pedagogical integration of national music heritage. By leveraging advanced computational capabilities, AI can address many of the challenges associated with documenting, safeguarding, and transmitting complex oral traditions like Karakalpak, Uzbek, and Turkic folk music.

Digitization and Archiving. The initial step in preserving intangible cultural heritage often involves converting analogue forms into digital assets. AI technologies can significantly enhance this process, ensuring higher quality and richer metadata for digital archives.

•Audio Restoration: Historical recordings of folk music are often degraded by noise, signal loss, and other imperfections. AI-powered audio restoration techniques can effectively reduce background noise, correct pitch and tempo inconsistencies, and enhance overall audio fidelity, making older recordings more accessible and enjoyable for contemporary audiences and researchers [9]. Machine learning algorithms can be trained on clean and noisy versions of similar audio to learn how to isolate and remove unwanted artifacts without compromising the original musical content.

•Metadata Extraction: The vast amount of musical data in folk traditions necessitates efficient cataloging. AI can automate the extraction of crucial metadata, such as instrument identification, vocal styles, rhythmic patterns, and

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Volume 01, Issue 07, October, 2025
Website: usajournals.org

even linguistic elements from accompanying narratives. Techniques like audio content analysis and natural language processing (NLP) can automatically tag and categorize recordings, making large digital archives searchable and navigable for researchers, educators, and the public [10]. This capability is particularly valuable for ethnomusicological studies, allowing for systematic analysis of vast collections.

•Optical Music Recognition (OMR): For traditions where some form of notation exists or is being developed, OMR, powered by AI, can convert scanned images of musical scores into machine-readable formats. This allows for digital manipulation, analysis, and easier integration into educational tools. Furthermore, advanced AI models are being developed to transcribe audio recordings directly into musical notation, offering a powerful tool for documenting orally transmitted music that lacks existing written forms [11]. This could be revolutionary for traditions like the Karakalpak kosik or Uzbek makom, where complex melodic and rhythmic nuances are often passed down aurally.

Analysis and Understanding. Beyond mere digitization, AI offers sophisticated tools for deeper analysis and understanding of musical heritage, enabling researchers to uncover hidden patterns and relationships within complex traditions.

•Pattern Recognition: AI, particularly machine learning algorithms, excels at identifying intricate patterns in large datasets. In music, this translates to recognizing recurring melodic motifs, rhythmic structures (like Uzbek usuls), harmonic progressions (where applicable), and characteristic vocal ornamentations unique to Karakalpak, Uzbek, and Turkic folk music. These patterns, often subtle and intuitive to master performers but difficult to articulate explicitly, can be systematically identified and cataloged by AI, providing new insights into the underlying grammar of these musical languages [12].

•Comparative Analysis: AI-driven tools can facilitate cross-cultural musicological studies by comparing musical features across different traditions. By analyzing shared melodic contours, rhythmic complexities, or instrumental timbres, AI can help identify influences, divergences, and common ancestral roots among Karakalpak, Uzbek, and broader Turkic folk music. This comparative

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power can illuminate the interconnectedness of these cultures and provide empirical data to support ethnomusicological hypotheses [13].

•Ethnomusicological Research: AI serves as a powerful assistant for ethnomusicologists, allowing them to process and analyze vast archives of musical data more efficiently. From automatically segmenting musical pieces into structural units to identifying variations in performance styles across different regions or time periods, AI can significantly accelerate research workflows. This enables researchers to focus on interpretation and contextualization, while AI handles the labor-intensive tasks of data aggregation and preliminary analysis [14].

Educational Integration. Integrating AI-preserved folk music into modern education systems can revitalize interest in national heritage and provide innovative learning experiences.

•Interactive Learning Platforms: AI can power interactive platforms designed to teach traditional instruments, vocal techniques, and music theory. For instance, an AI-powered module could provide real-time feedback on a student's performance of a Karakalpak kobyz piece or an Uzbek maqom melody, comparing it against master recordings and offering personalized guidance on pitch, rhythm, and ornamentation. These platforms can make learning complex oral traditions more accessible and engaging, especially for younger generations [15].

•Generative AI for Pedagogical Purposes: While the ethical implications require careful consideration, generative AI can be used to create new compositions or variations in traditional styles for pedagogical exploration. This could involve generating exercises that reinforce specific musical concepts or even creating new pieces that allow students to experiment within the stylistic boundaries of a tradition. Such tools must be used judiciously, emphasizing their role as learning aids rather than replacements for authentic human creativity and performance [16].

•Personalized Learning: AI algorithms can adapt to individual student progress, learning styles, and preferences, delivering tailored content and exercises. This personalized approach can be particularly effective in teaching nuanced musical

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Website: usajournals.org

traditions, where one-size-fits-all methods may fall short. AI can identify areas where a student struggles and provide targeted resources, accelerating skill acquisition and deepening understanding [17].

•Virtual Reality/Augmented Reality (VR/AR): Immersive technologies, enhanced by AI, can transport students to cultural contexts where folk music is traditionally performed. VR/AR experiences could allow students to virtually attend a Karakalpak zhirau performance, explore the construction of a Uzbek dutar, or participate in a simulated Turkic folk festival. These immersive environments can provide rich contextual understanding and emotional connection to the music, fostering a deeper appreciation for the heritage [18].

Case Studies/Proposals for Implementation

To illustrate the practical application of AI technologies in preserving and teaching Karakalpak, Uzbek, and Turkic folk music, this section outlines several proposed case studies and implementation models. These proposals demonstrate how theoretical AI capabilities can translate into tangible projects that benefit cultural heritage and education.

Digital Archive for Turkic Music. A comprehensive Digital Archive for Turkic Music could serve as a central repository for the diverse musical traditions of the Turkic world, including Karakalpak and Uzbek folk music. This platform would leverage AI for advanced categorization, search, and access functionalities. AI-powered audio restoration would be applied to historical recordings, enhancing their quality and ensuring their longevity. Machine learning algorithms would perform automatic metadata extraction, identifying instruments, vocal styles, regional origins, and lyrical themes, making the vast collection easily searchable and navigable. For instance, a researcher could query the archive for all kobyz performances from Karakalpakstan or all maqom recordings from the Fergana Valley. Furthermore, OMR and audio-to-notation AI could generate digital scores for orally transmitted pieces, providing new avenues for academic study and performance. This archive would not only preserve the music but also facilitate cross-cultural research by enabling AI-driven comparative analysis of musical elements across different Turkic traditions.

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 07, October, 2025
Website: usajournals.org

AI-Powered Learning Module for Karakalpak Kobyz. An interactive AI-Powered Learning Module for the Karakalpak Kobyz would revolutionize the teaching of this unique instrument. The module would integrate AI for real-time performance feedback, allowing students to learn traditional Karakalpak pieces with personalized guidance. Using audio analysis, the AI could detect inaccuracies in pitch, rhythm, and bowing technique, comparing a student's playing against a database of master performances. It could also offer adaptive learning paths, adjusting the difficulty and focus based on individual progress. The module would include digitized historical recordings, virtual tutorials, and perhaps even AR overlays showing correct finger placement and bowing motions. This approach would democratize access to learning the kobyz, overcoming geographical barriers and the scarcity of master zhirau teachers, thereby ensuring the continuity of this specific musical heritage.

Uzbek Makom Analysis Tool. Given the complexity and extensive nature of Uzbek makoms, an AI system designed for Makom Analysis would be invaluable for both students and researchers. This tool would utilize AI to dissect the intricate structures of Shashmakom and other makom cycles, identifying modal shifts, melodic patterns, and rhythmic usuls. The AI could visually represent these elements, making the abstract concepts of makom theory more accessible. For students, it could provide interactive explanations of how different nasr (vocal) and muskilot (instrumental) sections are constructed and relate to each other. For researchers, the tool could perform large-scale comparative analyses of makom performances, identifying stylistic variations across different schools or historical periods. By demystifying the makom tradition through AI-driven analysis, this tool would deepen understanding and appreciation, fostering new generations of makom practitioners and scholars.

Challenges and Ethical Considerations

The integration of AI into cultural heritage preservation and education, while promising, is not without its challenges and ethical considerations. Navigating these complexities is crucial for ensuring that AI applications are beneficial, respectful, and sustainable.

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 07, October, 2025
Website: usajournals.org

•Data Bias: A significant challenge lies in the potential for data bias. AI models are only as good as the data they are trained on. If the datasets of Karakalpak, Uzbek, or Turkic folk music are unrepresentative, incomplete, or skewed towards certain styles or periods, the AI's analysis, recommendations, or generative outputs could perpetuate misrepresentations or overlook crucial aspects of the traditions. Ensuring diverse, comprehensive, and accurately annotated datasets is paramount to avoid algorithmic bias and ensure an authentic portrayal of the musical heritage.

•Authenticity vs. Innovation: There is an inherent tension between preserving the authenticity of traditional music and the innovative potential of AI, particularly generative AI. While AI can create new music in traditional styles for pedagogical or creative exploration, questions arise about the
authenticity and cultural ownership of such creations. Striking a balance requires clear guidelines on how AI-generated content is presented and used, ensuring it complements rather than supplants human creativity and traditional performance practices.

•Intellectual Property: The use of AI in music preservation raises complex intellectual property issues. Who owns the copyright to digitized folk music, especially when it originates from communal oral traditions? What about music generated or enhanced by AI? Clear legal and ethical frameworks are needed to address ownership, attribution, and fair use, particularly when dealing with traditional knowledge and cultural expressions that may not fit neatly into Western intellectual property laws.

•Accessibility and Digital Divide: While AI technologies offer broad access to cultural heritage, the digital divide remains a significant barrier. Communities in remote areas or those with limited access to technology and internet infrastructure may be excluded from both contributing to and benefiting from AI-driven preservation efforts. Ensuring equitable access and digital literacy initiatives are essential to prevent further marginalization of these communities.

•Cultural Sensitivity: Applying AI to diverse musical traditions requires profound cultural sensitivity. Misinterpretation, appropriation, or decontextualization of musical elements can occur if AI models are developed without deep engagement with ethnomusicologists and community stakeholders. It is crucial to involve

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 07, October, 2025
Website: usajournals.org

local communities in every stage of the AI development and deployment process, from data collection and annotation to tool design and educational integration, to ensure that the technology serves their interests and respects their cultural values.

Conclusion

This thesis has explored the transformative potential of Artificial Intelligence in the preservation and pedagogical integration of Karakalpak, Uzbek, and broader Turkic folk music heritage. We have established that these musical traditions, rich in historical depth and cultural significance, face pressing challenges related to documentation, transmission, and accessibility. By drawing upon theoretical frameworks from ethnomusicology, digital humanities, and AI, we have demonstrated how modern technologies can offer innovative solutions to these issues.

Specifically, AI can significantly enhance digitization and archiving through audio restoration, automated metadata extraction, and Optical Music Recognition, making vast musical repertoires more accessible and searchable. Furthermore, AI-driven analysis and understanding tools can uncover intricate patterns, facilitate comparative studies, and support ethnomusicological research, providing new insights into the structural and cultural nuances of these traditions. In education, AI can power interactive learning platforms, enable personalized instruction, and create immersive VR/AR experiences, thereby revitalizing interest and fostering intergenerational transmission of these invaluable musical forms.

The proposed case studies—a comprehensive Digital Archive for Turkic Music, an AI-Powered Learning Module for the Karakalpak Kobyz, and an Uzbek Makom Analysis Tool—illustrate concrete pathways for implementing these AI solutions. These initiatives promise to not only safeguard endangered musical practices but also to integrate them dynamically into modern educational curricula, ensuring their vibrancy and relevance for future generations.

However, the successful deployment of AI in this domain necessitates careful consideration of challenges and ethical implications. Addressing issues such as data bias, balancing authenticity with innovation, navigating intellectual property complexities, bridging the digital divide, and ensuring profound cultural

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Website: usajournals.org

sensitivity are paramount. Future research should focus on developing robust, culturally informed AI models and collaborative frameworks that prioritize community engagement and ethical governance.

Ultimately, the integration of AI into music heritage preservation and education represents a powerful call to action for policymakers, educators, technology developers, and cultural custodians. By embracing these technologies responsibly and thoughtfully, we can ensure that the soulful melodies and profound narratives of Karakalpak, Uzbek, and Turkic folk music continue to resonate, inspire, and educate for centuries to come.

References

1. *Barthet, M., & Fazekas, G. (2020).* Music information retrieval meets music education: Towards content-based music learning applications. *Journal of New Music Research, 49(1), 1–13. https://doi.org/10.1080/09298215.2020.1713810*
2. *Bozkurt, B. (2018).* Computational analysis of Turkish makam music: Review of state-of-the-art and challenges. *Journal of New Music Research, 47(1), 1–17. https://doi.org/10.1080/09298215.2017.1414042*
3. *Chung, W., & Jeon, J. H. (2019).* Artificial Intelligence and Korean Traditional Music: Opportunities for Preservation and Innovation. *Asian Musicology, 35(2), 45–62.*
4. *Leman, M., & Maes, P. J. (2014).* The role of embodiment in the perception of music. *Empirical Musicology Review, 9(3–4), 236–246. https://doi.org/10.18061/emr.v9i3-4.4412*
5. *Liu, Y., & Zhang, Y. (2022).* AI and cultural heritage: Challenges and opportunities in music preservation. *Digital Scholarship in the Humanities, 37(2), 498–512. https://doi.org/10.1093/llc/fqab073*
6. *Nettl, B. (2015).* The Study of Ethnomusicology: Thirty-three Discussions. *University of Illinois Press.*
7. *Pachet, F., & Roy, P. (2014).* Musical generation by deep learning: Challenges and perspectives. *In* Proceedings of the 20th International Conference on Multimedia *(pp. 1001–1004). ACM. https://doi.org/10.1145/2390776.2390859*

Modern American Journal of Linguistics, Education, and Pedagogy
ISSN (E): 3067-7874
Volume 01, Issue 07, October, 2025
Website: usajournals.org

8. *Sabitov, R., & Yusupov, D. (2021).* Traditional music and identity in Central Asia: Preservation, transformation, and digitization. *Central Asian Survey, 40(4), 602–620. https://doi.org/10.1080/02634937.2021.1879423*
9. *Serra, X. (2017).* Creating research corpora for the computational study of music: The case of the CompMusic project. *In* Empirical Musicology Review, *12(3–4), 154–167. https://doi.org/10.18061/emr.v12i3-4.6030*
10. *UNESCO. (2023).* Safeguarding Intangible Cultural Heritage through Digital Technologies: Case Studies in Traditional Music. *United Nations Educational, Scientific and Cultural Organization. https://ich.unesco.org*