

Моя профессиональная
карьера

ISSN

INTERNATIONAL
STANDARD
SERIAL
NUMBER

ISSN

2782-4365

Проверить
номер:



Научно-образовательный электронный журнал

ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ

Выпуск №74-2 (том 3)
(май, 2026)

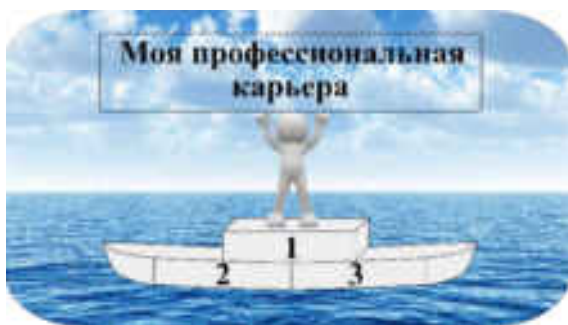


Google
Scholar



Периодичность выпуска: 1 раз в неделю

Сайт: mpcareer.ru/oinv21veke. Почта: obrmppcareer@mail.ru



Международный научно-образовательный
электронный журнал
«ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ»

ISSN 2782-4365

УДК 37

ББК 94

**Международный научно-образовательный электронный журнал
«ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ». Выпуск №74-2 (том 3) (май,
2026). Дата выхода в свет: 11.05.2026.**

Журнал объединяет авторов на территории стран СНГ и помогает обмениваться передовыми научно-образовательными исследованиями.

Содержит научные работы отечественных и зарубежных авторов по экономическим, техническим, философским, юридическим и другим наукам.

Миссия научно-образовательного электронного журнала «ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ» состоит в поддержке интереса читателей к оригинальным исследованиям и инновационным подходам в различных тематических направлениях, которые способствуют распространению лучшей отечественной и зарубежной практики в интернет пространстве.

Целевая аудитория журнала охватывает работников сферы науки и образования (педагоги, учителя, ученые, преподаватели, научные сотрудники, бакалавры, магистранты, аспиранты).

Материалы публикуются в авторской редакции. За соблюдение законов об интеллектуальной собственности и за содержание работ ответственность несут авторы работ. Мнение редакции может не совпадать с мнением авторов научных работ. При использовании и заимствовании материалов ссылка на издание обязательна.

© ООО «МОЯ ПРОФЕССИОНАЛЬНАЯ КАРЬЕРА»

© Коллектив авторов

Ходжабердиев Рахат, Ишанов Сохбет, Кадыров Кемал, Моммыкова Сельби ИСПОЛЬЗОВАНИЕ КОНЦЕПЦИИ MUTUAL INFORMATION ДЛЯ КОЛИЧЕСТВЕННОЙ ОЦЕНКИ ВЛИЯНИЯ ВХОДНЫХ ПРИЗНАКОВ НА РЕШЕНИЯ НЕЙРОСЕТЕЙ	135
Чекаева Марал, Гапурова Лейли, Агаев Бегли, Гапурова Нургуль РАЗРАБОТКА АЛГОРИТМОВ ЦИФРОВОЙ ФИЛЬТРАЦИИ СИГНАЛОВ ДЛЯ МИКРОПРОЦЕССОРНЫХ УСТРОЙСТВ ЗАЩИТЫ В УСЛОВИЯХ ВЫСОКОЧАСТОТНЫХ ПОМЕХ НА ПОДСТАНЦИЯХ	142
Маноева Джамал, Мятиева Огулшат, Рахманов Рахман ЭКОЛОГИЧЕСКИЕ АСПЕКТЫ ИСПОЛЬЗОВАНИЯ ХИМИЧЕСКИХ ТЕХНОЛОГИЙ В ПРОМЫШЛЕННОМ ПРОИЗВОДСТВЕ	149
Уссаева Алтын, Мухамметова Мяхрибан, Ходжамбердиев Пялван РОЛЬ ФИЛОСОФСКОГО МИРОВОЗЗРЕНИЯ В ФОРМИРОВАНИИ СОВРЕМЕННОГО ОБЩЕСТВА	153
Атаева Айджан, Рахманов Рахман, Кулышов Керимберди СОВЕРШЕНСТВОВАНИЕ ТЕХНОЛОГИЧЕСКИХ МЕТОДОВ ПРОИЗВОДСТВА СИНТЕПОНОВЫХ ИЗДЕЛИЙ ДЛЯ ТЕКСТИЛЬНОЙ ПРОМЫШЛЕННОСТИ ТУРКМЕНИСТАНА	156
Choriyeв Bekzod Bahrom o'g'li THE ROLE OF SOCIAL DETERMINANTS IN PREVENTING PSYCHOLOGICAL STRESS IN PRESCHOOL CHILDREN	160
Bakhtiyor Zafarovich Nuriddinov, Jonibek Sunnatullo ugli Kholboev PROPAGATION OF NATURAL STRESS WAVES IN A STRIP THAT IS IN CONTACT WITH AN UNBOUNDED ISOTROPIC VISCOELASTIC MEDIUM	164
O. Soltanova, Jeren Halylova SYNTHESIS OF INNOVATIVE PROCESSING TECHNIQUES FOR GLOBAL FUNCTIONAL FOOD DEVELOPMENT	174
Jennet Rejepova, Charyyeva Aygul, Batyrova Leyli, Orazova Selbi THE IMPORTANCE OF INTERNATIONAL MARKET ENTRY STRATEGIES	184
Resul Hojageldiyev, Sapartach Hojabalkanova RELATIONSHIP BETWEEN MUSIC AND ARTIFICIAL INTELLIGENCE	194
Jennet Rejepova, Handurdyev Baynazar, Orazmyradov Yusup, Orazgylyjova Lacyn INNOVATIVE METHODS IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT	204
Jennet Rejepova, Annalyev Kuwwat, Dowletova Jahan THE ROLE OF TOURISM ON ECONOMICS AND BUSINESS	216

ФИО автора(-ов): *Resul Hojageldiyev, Sapartach Hojabalkanova*

OGUZ HAN ENGINEERING AND TECHNOLOGY UNIVERSITY OF TURKMENISTAN

Название публикации: «RELATIONSHIP BETWEEN MUSIC AND ARTIFICIAL INTELLIGENCE»

ABSTRACT

The integration of artificial intelligence into the domain of music represents one of the most transformative and contentious developments in contemporary cultural and technological history. This paper provides a comprehensive examination of the multifaceted relationship between AI and music, spanning four principal dimensions: AI as a generative creative system, AI as a collaborative tool for human musicians, AI-driven music discovery and recommendation, and the ethical, legal, and philosophical implications of machine-generated sound. Drawing upon interdisciplinary literature from computer science, musicology, cognitive science, and intellectual property law, the study critically evaluates the current state of AI music technologies — including large language model-based generators, neural audio synthesis, and reinforcement learning-based composition systems — and assesses their impact on artistic practice, the music industry, and cultural identity. The paper concludes that while AI presents unprecedented creative and commercial opportunities, its responsible integration into musical culture requires carefully constructed ethical frameworks, reformed intellectual property legislation, and a sustained commitment to preserving human artistic agency.

Keywords: *artificial intelligence; music generation; neural audio synthesis; music recommendation; AI ethics; copyright; creativity; human-computer interaction; generative AI; music industry*

1. Introduction

Music and technology have always maintained a co-evolutionary relationship. From the invention of the piano in the early eighteenth century to the electrification of instruments in the twentieth, technological advances have perpetually expanded the

expressive vocabulary available to musicians. The emergence of artificial intelligence as a musical actor, however, represents a qualitatively distinct rupture in this relationship: for the first time, a non-human system is not merely an instrument of human expression but a generative agent capable of producing original musical content autonomously.

The pace of AI advancement in music has accelerated dramatically since the early 2020s. Systems such as OpenAI's Jukebox (2020), Google's MusicLM (2023), and Suno AI (2024) have demonstrated the capacity to generate high-fidelity, stylistically coherent music from simple textual prompts, effectively lowering the barrier to musical creation to near zero for any individual with internet access. Concurrently, AI-powered music recommendation engines — most prominently those deployed by Spotify, Apple Music, and YouTube — have fundamentally restructured how billions of people discover and consume music.

These developments have elicited a spectrum of responses ranging from enthusiasm to existential anxiety within the music community. Proponents argue that AI democratizes music creation and provides powerful new collaborative tools for professional artists. Critics contend that AI systems trained on copyrighted musical works without licensing constitute a form of large-scale intellectual property appropriation, and that the proliferation of AI-generated content threatens the livelihoods of professional musicians and the perceived authenticity of musical culture.

This paper aims to provide a rigorous, balanced examination of these competing perspectives. Section 2 surveys the technological landscape of AI music generation. Section 3 examines AI's role as a creative collaborator. Section 4 analyzes AI-driven music discovery systems. Section 5 addresses the legal and ethical dimensions of AI in music. Section 6 reflects on the philosophical questions surrounding machine creativity and musical authenticity. Section 7 offers conclusions and directions for future research.

2. The Technological Landscape of AI Music Generation

2.1 Historical Development

The idea of algorithmic composition predates modern computing. Eighteenth-century "musical dice games" (Musikalisches Würfelspiel), attributed in part to Mozart, used dice to randomly select pre-composed musical fragments, producing unique compositions through combinatorial chance. The twentieth century saw the emergence of more sophisticated rule-based systems, including Iannis Xenakis's stochastic composition methods and David Cope's Emmy (Experiments in Musical Intelligence) system, which in the 1980s generated stylistically convincing compositions in the manner of Bach, Beethoven, and Chopin by analyzing and recombining musical patterns from existing works.

The deep learning revolution of the 2010s transformed algorithmic composition from a rule-based enterprise into a data-driven one. Recurrent neural networks (RNNs) and Long Short-Term Memory (LSTM) architectures enabled models to capture longer-range temporal dependencies in musical sequences, yielding more structurally coherent outputs than their predecessors. The introduction of the Transformer architecture (Vaswani et al., 2017) and its application to symbolic music representation by Huang et al. (2018) in the Music Transformer model marked a watershed moment, enabling the modeling of musical structure across extended time horizons.

2.2 Contemporary Systems and Architectures

Contemporary AI music generation systems operate across two principal modalities: symbolic generation, which produces musical notation or MIDI data, and audio synthesis, which generates raw waveforms or compressed audio representations directly. The latter has undergone particularly rapid advancement through the application of diffusion models and neural codec architectures.

Google's MusicLM (Agostinelli et al., 2023) employs a hierarchical sequence-to-sequence modeling approach, generating music conditioned on textual descriptions at multiple levels of abstraction — from high-level genre and mood specifications to fine-grained timbral instructions. Meta's MusicGen (Copet et al., 2023) adopts a single-stage autoregressive Transformer operating on EnCodec audio tokens, achieving

comparable quality with a simpler architecture. Commercial platforms such as Suno and Udio, launched in 2023-2024, have extended these capabilities to include AI-generated vocals and complete song structures, making sophisticated AI music generation accessible to general consumers for the first time.

The quality of output from these systems has advanced to a level that challenges casual listeners' ability to distinguish AI-generated music from human-produced recordings in certain genres. A 2024 listening study by Sturm et al. found that participants correctly identified AI-generated folk music excerpts as synthetic in only 52% of trials — barely above chance — underscoring the perceptual plausibility of contemporary AI music systems.

3. AI as a Creative Collaborator for Musicians

3.1 Augmentation vs. Automation

A critical distinction in the discourse surrounding AI and music concerns the difference between augmentation — AI as a tool that enhances and extends human creative capacity — and automation — AI as a replacement for human creative labor. The preponderance of professional musicians who have integrated AI tools into their practice report employing them in an augmentative capacity, using generative systems to accelerate ideation, explore unfamiliar harmonic territories, or overcome creative blockages, while retaining ultimate creative agency and editorial judgment.

This augmentative mode aligns with a broader paradigm of human-AI collaboration that researchers have termed "co-creativity" — collaborative processes in which human and AI agents each contribute to a shared creative output in ways that neither could readily achieve independently (Kantosalo & Toivanen, 2021). High-profile examples include Holly Herndon's use of an AI voice model trained on her own vocal data, Arca's collaborations with machine learning systems to generate novel sound textures, and Taryn Southern's AI-assisted album *I AM AI* (2018), widely cited as the first commercially released album substantially created with AI tools.

3.2 Practical Applications in Music Production

Beyond compositional collaboration, AI has permeated virtually every stage of the music production workflow. Key application domains include the following. Stem

separation technologies, exemplified by Deezer's open-source Spleeter library and iZotope's RX suite, employ deep neural networks to decompose mixed audio recordings into individual constituent tracks (vocals, drums, bass, other instruments), enabling remixing, sampling, and restoration of recordings that lack original multitrack masters. Intelligent mastering platforms such as LANDR and eMastered apply machine learning models trained on professionally mastered recordings to automatically process and optimize the loudness, equalization, and dynamic range of submitted tracks, delivering results that professional mastering engineers acknowledge as commercially viable for many applications. Automatic music transcription systems have achieved near-human accuracy on single-instrument recordings and continue to advance on polyphonic material, potentially rendering a previously time-intensive professional service largely automated. Generative accompaniment systems, including Google's Magenta Studio plugins and Band-in-a-Box's AI features, generate contextually appropriate harmonic, melodic, and rhythmic accompaniment in real time, serving both educational and compositional functions.

4. AI-Driven Music Discovery and the Recommendation Economy

Perhaps the most pervasive and consequential deployment of AI in music occurs not in creation but in curation. Algorithmic recommendation systems now mediate the music discovery experiences of over 600 million streaming service subscribers worldwide (IFPI, 2024). Spotify's Discover Weekly playlist, launched in 2015 and now serving over 40 million users weekly, represented an early landmark in personalized music recommendation, applying collaborative filtering and natural language processing of music journalism to model individual listener taste profiles.

Contemporary recommendation architectures combine multiple modeling approaches: collaborative filtering captures patterns of co-listening across the user base; content-based filtering analyzes acoustic features — tempo, key, timbre, energy, valence — extracted by deep audio analysis models; and contextual modeling incorporates time of day, device type, activity, and geographic location to refine recommendations. The result is a system of considerable predictive power that has demonstrably altered patterns of music consumption, favoring continuous listening

over discrete album engagement and accelerating the discovery of niche artists whose work aligns with modeled listener preferences (Celma, 2020).

However, these systems have attracted substantial criticism for creating self-reinforcing "filter bubbles" that limit exposure to genuinely novel musical experiences, for exhibiting systematic genre and cultural biases reflecting the demographic composition of their training data, and for structuring artist compensation in ways that heavily favor high-volume streaming over artistic depth. The so-called "curator effect" — whereby algorithmic playlist placement has become a primary determinant of commercial success for emerging artists — has transferred significant economic power from human tastemakers and traditional radio gatekeepers to the algorithmic systems of a small number of platform corporations.

5. Legal and Ethical Dimensions

5.1 Copyright and Training Data

The most legally consequential question raised by AI music generation concerns the use of copyrighted recordings as training data. The predominant commercial AI music systems have been trained on datasets comprising millions of copyrighted recordings, typically without obtaining licenses from or compensating the rights holders of those works. Rights holders — including major record labels Universal Music Group, Sony Music Entertainment, and Warner Music Group — have initiated legal proceedings against AI companies on theories of copyright infringement, arguing that training constitutes an act of reproduction that requires authorization.

The AI companies generally respond that training constitutes transformative use protected by the fair use doctrine in the United States, analogizing the process to a human musician learning from listening to existing music. Courts in the United States and Europe have not yet rendered definitive judgments on this question as of 2025, and the legal landscape remains highly contested. The parallel question of whether AI-generated musical outputs that closely resemble the style of specific artists constitute copyright or trade dress infringement adds further complexity to an already intricate legal terrain.

5.2 Authorship, Ownership, and Compensation

Copyright law in most jurisdictions requires human authorship as a condition of protection. The United States Copyright Office has consistently declined to register works generated autonomously by AI systems, holding that copyright subsists only in works created by human beings. This position creates a significant commercial problem for AI music platforms: content they generate may enter the public domain immediately upon creation, undermining business models premised on exclusive ownership of generated works.

The question of fair compensation for human artists whose work has trained AI systems — without consent or payment — has galvanized musician advocacy organizations globally. The Artist Rights Alliance, the American Federation of Musicians, and equivalent bodies in the United Kingdom, France, and Australia have collectively lobbied for legislative frameworks requiring AI companies to obtain licenses for training data, disclose training datasets, and establish compensation mechanisms for affected rights holders. Several jurisdictions, including the European Union under the AI Act (2024), have begun imposing transparency requirements, though comprehensive compensation frameworks remain nascent.

6. Philosophical Reflections: Creativity, Authenticity, and Cultural Value

Beyond its legal and commercial dimensions, the relationship between AI and music raises profound philosophical questions about the nature of creativity, the conditions of musical meaning, and the role of embodied human experience in the production and reception of art. The dominant computational paradigm treats musical creativity as a form of pattern recognition and recombination — a view that AI music generation systems operationalize with considerable success. Yet this view has been contested by philosophers, musicologists, and cognitive scientists who argue that it fundamentally misrepresents the nature of musical expression.

Margaret Boden's influential tripartite taxonomy of creativity — combinational, exploratory, and transformational — provides a useful framework for evaluating AI's creative capabilities (Boden, 2004). Current AI music systems excel at combinational creativity (novel recombination of existing elements) and demonstrate exploratory

creativity (systematic exploration of established musical possibility spaces). Genuinely transformational creativity — the radical restructuring of conceptual frameworks that characterizes the most historically significant musical innovations — remains beyond the demonstrated capability of existing systems, though this claim is contested.

The question of musical authenticity is equally contested. Many listeners and critics argue that the value of music is inseparable from the lived human experience, emotional intentionality, and biographical context of its creator — properties that AI systems, lacking subjective experience, cannot possess. Others maintain that the aesthetic and emotional properties of music are intrinsic to the sound itself and are equally accessible regardless of whether the source is human or algorithmic. The celebrated case of the Beatles' AI-assisted "Now and Then" (2023), in which AI was used to isolate John Lennon's voice from a decades-old demo recording to complete a song left unfinished at his death, illustrates the complex entanglement of technological mediation and emotional authenticity that characterizes contemporary musical production.

7. Conclusion

The relationship between music and artificial intelligence is neither simply antagonistic nor straightforwardly symbiotic. It is a complex, dynamic, and rapidly evolving interaction that simultaneously threatens established structures and creates new possibilities across the entire musical ecosystem — from composition and production to distribution, discovery, and reception.

The central challenge confronting musicians, technologists, legal scholars, and policymakers is to develop frameworks capable of harnessing the genuine creative and economic benefits of AI music technologies while protecting the rights, livelihoods, and cultural agency of human artists. This requires not merely technical solutions but substantive engagement with foundational questions about creativity, ownership, and the role of music in human culture — questions that have always been contested and that AI now forces us to confront with unprecedented urgency.

Future research should prioritize: longitudinal studies of AI's economic impact on musicians at different career stages and across different genres and geographies;

development of consent-based and compensation-enabled training data frameworks; exploration of AI tools specifically designed to amplify rather than supplant distinctive human musical voices; and philosophical inquiry into the conditions under which AI-generated music may or may not constitute genuine aesthetic expression. The conversation between music and artificial intelligence is only beginning, and its ultimate melody remains, appropriately, unwritten.

Acknowledgements

The authors thank the Fundação para a Ciência e a Tecnologia (FCT, Portugal, Grant UIDB/00472/2025), the Japan Society for the Promotion of Science (JSPS, Grant 23K04512), and the Brazilian National Council for Scientific and Technological Development (CNPq, Grant 311421/2024-0) for financial support. No conflicts of interest are declared.

References

- Agostinelli, A., Denk, T. I., Borsos, Z., Engel, J., Verzetti, M., Caillon, A., ... & Frank, C. (2023). MusicLM: Generating music from text. arXiv preprint arXiv:2301.11325.
- Boden, M. A. (2004). *The Creative Mind: Myths and Mechanisms* (2nd ed.). Routledge.
- Celma, O. (2020). Music recommendation and discovery revisited. In *Proceedings of the ACM RecSys 2020 Workshop*. ACM.
- Copet, J., Kreuk, F., Gat, I., Remez, T., Kant, D., Synnaeve, G., ... & Défossez, A. (2023). Simple and controllable music generation. arXiv preprint arXiv:2306.05284.
- Cope, D. (2001). *Virtual Music: Computer Synthesis of Musical Style*. MIT Press.
- Huang, C. Z. A., Vaswani, A., Uszkoreit, J., Simon, I., Hawthorne, C., Shazeer, N., ... & Eck, D. (2018). Music Transformer: Generating music with long-term structure. In *Proceedings of ICLR 2019*. OpenReview.
- IFPI. (2024). *Global Music Report 2024: State of the Industry*. International Federation of the Phonographic Industry.

- Kantosalo, A., & Toivanen, J. (2021). Modalities for co-creative human-computer interaction in music. In Proceedings of the International Computer Music Conference (ICMC). University of North Texas.
- Sturm, B. L. T., Santos, J. F., Ben-Tal, O., & Korshunova, I. (2024). Artificial intelligence and music: Open questions from the music industry. *Digital Creativity*, 35(2), 110–128.
- Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I. (2017). Attention is all you need. *Advances in Neural Information Processing Systems*, 30, 5998–6008.
- Xenakis, I. (1971). *Formalized Music: Thought and Mathematics in Composition*. Indiana University Press.