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A scholarly study on the practical model of empowering music education with generative artificial intelligence (AIGC) in the metaverse scenario

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Abstract

In the modern XXI century, the use of artificial intelligence is becoming the norm, as it helps to improve people's lives. It is likely that using the connection of the metaverse and AI in the development of platforms for music education will be effective. The metaverse, which is a permanent virtual space, can be useful for music education when artificial intelligence is used in it. This article should prove this hypothesis. This article aims to compile a potential model for the use of artificial intelligence (AI) and the metaverse in music education. They are used to achieve the goals of traditional scientific research methods, for example, synthesis, analysis, deduction and induction, classification and description. However, a special scientific method will also be used, which is called the historical-genetic method (it is often used even by professional historians), the essence of which is to consistently track the causes of the origin of any phenomenon or process, and then - in a consistent description of it, in order to eventually come to some conclusion. The conclusions of this article are as follows: the combination of AI and the metaverse makes education in terms of music much more accessible to different segments of the population, which is extremely important. Examples of the use of AI in the metaverse in the form of using AI as a spam defender, as well as a training coordinator, are of practical importance for developers.

For citation

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Keywords
Artificial intelligence, music, education, metaverse.

Introduction

The rapid development of digital technology has revolutionized many fields, including music education. In this paper, we explore the concept of a collaborative music education model based on “Generative AI + Metaverse” and analyze its potential application in contemporary music education.

Of course, this topic often appears in special scientific literature. However, at the moment the state of scientific knowledge on the topic has "white spots".

There are several points of view on the inclusion of AI in music education. One of them adheres to Hasse-Rapoport [Haase-Rapoport, 1990], A. Gorbacheva [Gorbacheva, 2018, 145-154], L. Nagornaya [Nagornaya, 2020, 32-43] and Y. Ovchinnikova [Ovchinnikov, 2022, 46-64], according to this theory, the use of AI in music and music education is useful, but it is worth solving the issue with ethics. A. Razin [Razin, 2019, 57-73] and A. Ignatiev [Ignatiev, 2022] believe that it is worth introducing special laws that would regulate AI in art.

However, other scientists believe that AI should develop anyway. For example, thinks so V. Petrushkin [Petrushkin, 2019]. It is obvious that the discussion at this time is not over yet, and therefore the topic of the work continues to be relevant. AI is becoming an integral part of life, as is the metaverse, and therefore research on their introduction into society is relevant.

Thus, it can be seen that the advantages of using AI in the metaverse for teaching music are still poorly studied, and therefore the article has significance and novelty.

Materials and methods

General scientific methods such as synthesis, analysis, deduction, induction, classification, comparison and description will be used as methods in this scientific article. However, special scientific methods will also be used, for example, the historical-genetic method, which is also often used by professional historians. It allows you to carefully and carefully monitor how a process or object was formed in history.

This article will be written on the basis of the principles of objectivism.

The purpose of writing this article is to create a comprehensive analysis of the potential application of the model of modern music education, which is based on the combination of artificial intelligence and the metaverse.

Thus, the tasks to achieve this goal will be as follows:

1) to trace the formation of the use of artificial intelligence in music education;

2) determine the role of the metaverse in music education;

3) to suggest possible methods of using the "Artificial Intelligence + Metaverse" model in music education.

Results

The way to create a piece of music is quite complicated in AI. A person should give the machine a command and program it in such a way that it outputs not a set of sounds, but a melody. To do this, you have to resort to mathematics, as well as functional analysis [Shwars, 2020].

One of the main achievements of the use of AI in music is the ability of AI to adapt to the individual narrow preferences of the musician [Shaip, 2023]. For example, if a teacher understands that a student needs to crawl more or listen to a certain genre of music with its specific features, then it will be much easier to create the right melody with the help of artificial intelligence, as well as faster than writing it to the teacher himself or a professional composer. The machine works faster than a person.

Artificial intelligence is the ability of a digital computer or a computer–controlled robot to perform tasks that are considered the prerogative of a person. It is known that research in the field of artificial intelligence has already influenced many major industries, and the music industry is certainly one of them. Artificial intelligence is actively used to form recommendations for individual listeners. Analyzing the user's habits, preferences, and even physiological reactions, you can create individual playlists or offer new music that matches his taste or mood.

Consider the use of artificial intelligence by the Spotify music service. According to the latest data, this music service is the leader among other streaming platforms, covering 31% of the music market by the number of users [Palmov, 2023].

Spotify's artificial intelligence supports music and podcast recommendations designed to ensure long-term customer satisfaction. To do this, Spotify uses user data, from creating a playlist to listening history and how people interact with the platform. These recommendations are displayed on the main screen, which is divided into rows of cards containing both recently listened audio content and a new, recommended one based on the listener's behavior. In particular, Spotify relies heavily on reinforcement learning. The idea of the latter is that the system interacts with the environment, learning in parallel, and receives a reward for performing actions. This reward is a loyal customer: the service retains its consumers, because the longer a person interacts with it, the more accurate the recommendations will be.

In addition, Spotify uses artificial intelligence to provide natural language search. Natural Language Processing (NLP) and deep learning help the service make it easier to find the necessary content.

Apple Music uses artificial intelligence even more intensively. Apple has acquired AI Music, a startup that uses artificial intelligence to create personalized soundtracks and adaptive music. AI Music has developed an "Infinite Music Engine" designed for marketers, publishers, fitness trainers and creative agencies. The technology is capable of generating dynamic soundtracks that change depending on user interaction. Music during a workout, for example, can change depending on the user's heartbeat, adjusting to the intensity of the workout. AI Music described this as a feature that could allow advertisers to create audio that matches the context, such as the user's mood [ibid.].

Amazon Music is the third most popular streaming service. Alexa is Amazon's unique voice recognition technology that makes music playback incredibly easy. The machine learning tool, which is Alexa, works by identifying keywords. With the help of a voice appeal, she can identify a line from a song and reproduce the desired work by contacting the Amazon cloud, and all this happens in a fraction of a second [ibid.].

Having considered three music services: Spotify, Apple Music and Amazon Music, we can conclude that the main task of using artificial intelligence in their system is to improve the user experience and personalize content in the music streaming industry. They have many similar functions, such as searching for a song by line from the text and individual playlists created by artificial intelligence.

A natural language search can recognize synonyms and paraphrasing, which means the same thing that the user was trying to find. The name of the query does not necessarily have to include the words

that are used in the search, artificial intelligence will add as a result all relevant materials on the topics. This function is most actively used when searching for podcasts.

Obviously, this way it is possible to create, among other things, services that are aimed at special musical education, where the AI will perform all the same functions as a coordinator and defender against spam and copyright violations. He will do it faster and easier than an ordinary person would do, and therefore AI should be used in creating platforms for music education.

We should talk about how AI and the metaverse relate. Obviously, creating a metaverse is a long and difficult process. The metaverse is a concept describing a hypothetical version of the Internet of the future. It is an immersive online space in 3D format, where users will be presented as personal avatars and will be able to explore digital worlds using virtual reality (VR), augmented reality (AR) and other similar technologies. Instead of accessing the Internet through a computer screen or smartphone, we will be able to combine the physical and virtual worlds. As a result, the metaverse will allow you to work, play and communicate using various three-dimensional spaces. The concept of the metaverse was proposed by writer Neil Stevenson in his 1992 science fiction novel Avalanche [Haas, 2023].

In the diagram below, you can see the internal basic structure of any metaverse [Layers of the Metaverse, 2023].

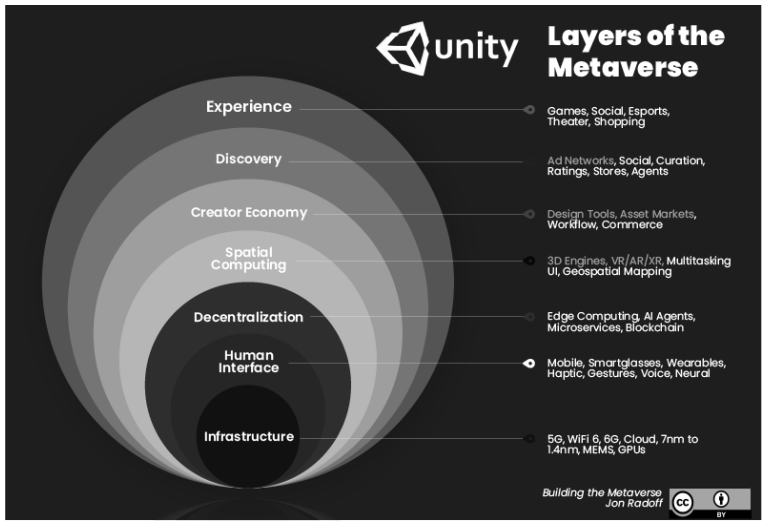

Fig. 1 Layers of the metaverse. A source: Layers of the Metaverse (2023) (https://i.pinimg.com/originals/9e/0b/ac/9e0baca59ec29fe5c581c46a7d069de0.png)

AI and the metaverse can be linked to create chatbots that will be available 24/7 every minute, to ensure the inclusiveness of AI, personalization of metaverse users (so-called "avatars"), AI will also help to detect spam in the metaverse in a timely manner. AI can be used to create human-like non-player characters (NPCs) that will interact with users in a virtual environment. These characters will be able to "see" and "hear" users, understand their speech, making the game more immersive. Moreover, AI-based game characters will be able to communicate more plausibly, using body language and speech to simulate realistic conversations [Haas, 2023].

Thus, it can be assumed that on the basis of the connection of the metaverse and AI, it is possible to create special programs in which those students who, for various reasons, do not have the opportunity to attend ordinary music schools can study music. For example, it is acceptable to assume that the platform created on the basis of the formula "Metaverse + AI" will not only generate the melodies

needed for learning quickly, but also allow all participants in the educational process to communicate closely.

Discussion

However, there is a discussion on this topic in the scientific community.

Of course, problems remain - for example, the issue of the ethics of using AI in art is still extremely acute [Palmov, 2023, 198-203]. The problem is that AI can potentially take away work from musicians, as well as music teachers, which will lead to unemployment. Therefore, the question arises: how ethical is the use of AI in art? However, scientists assure that there is nothing to worry about, because AI still does not know how to work without human orders without errors [Artificial intelligence and generative music: will neural networks deprive musicians of work, 2021].

Scientists do not yet have a single point of view on this.

We agree with this point of view presented by the scientist Razin and believe that it is necessary to find a reasonable balance between the use of AI in our lives and the work of the person himself.

The results presented in the article are similar to the conclusions that the scientist Hamse-Rapoport comes to in his works, for example. However, it should be noted that the issues of the relationship between AI and the metaverse are not considered by scientists so often.

Conclusion

It is possible to come to the following conclusions theses.

1) The integration of generative AI and the metaverse in music education has the potential to revolutionize teaching methods and enhance student learning experiences. By exploring the potential application of this collaborative music education model, this paper provides new perspectives for music educators to consider when integrating technology into their teaching practices. However, despite the significant potential benefits, it is important to also consider the associated challenges and obstacles that may arise with the implementation of this model.
2) It is proposed to create special platforms on the Internet in which music will be taught in the form of a metaverse, this will provide a better degree of immersion in the subject. AI in the metaverse performs auxiliary functions, for example, with the help of artificial intelligence, it is possible to repair breakdowns on servers much faster, create melodies for students faster, which will be made according to individual requests, and AI will also help to serve spam security.

Thus, it is permissible to conclude at the end of this article that the effectiveness of the introduction of AI into the metaverse for teaching music has prospects. This will help not only to make education more accessible from the point of view of geography, that is, students will be able to study anywhere in the world, but also to make education easier and clearer, as well as faster, because AI generates melodies easier and faster than a composer.

Obviously, it is worth continuing to study this area further, as well as developing new projects.

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Исследование практической модели расширения возможностей музыкального образования с помощью генеративного искусственного интеллекта (AIGC) в сценарии метавселенной

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Аннотация

В XXI веке использование искусственного интеллекта становится нормой, так как данная технология помогает улучшить жизнь людей. Ожидается, что использование связи метавселенной и ИИ при разработке платформ для музыкального образования будет эффективным. Метавселенная, представляющая собой постоянно действующее виртуальное пространство, может быть полезна для музыкального образования при использовании в ней искусственного интеллекта. Данная статья призвана доказать эту гипотезу. Цель статьи – разработка потенциальной модели использования искусственного интеллекта (ИИ) и

метавселенной в музыкальном образовании. Для достижения данной цели авторами использованы традиционные методы научного исследования, в частности синтез, анализ, дедукция и индукция, классификация и описание. Также используется и особый научный метод, который называется историко-генетическим методом (его часто используют даже профессиональные историки), суть которого заключается в последовательном отслеживании причин возникновения какого-либо явления или процесса, а затем – в последовательном его описании, чтобы в итоге прийти к какому-то выводу. Авторы приходят к следующим выводам: сочетание ИИ и Метавселенной делает музыкальное образование гораздо более доступным для разных слоев населения, что крайне важно. Примеры использования ИИ в метавселенной в качестве защитника от спама, а также координатора обучения имеют практическое значение для ученых.

Для цитирования в научных исследованиях

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Ключевые слова

Искусственный интеллект, музыка, образование, метавселенная.

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