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# Experimental perspectives on artificial intelligence in music composition

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**Abstract:** The article is a musicological treatment of new opportunities to analyse, research, create music, etc., from the perspective of new discoveries and experiments that take place today in the virtual world, exposed in open access sources. The aim of the article is to explore the process of the dynamic evolution of artificial intelligence and its impact on academic music. Throughout the 20th and 21st centuries, different companies worked on developing various versions of artificial intelligence technologies capable of composing music. One of the most important start-ups in the field of creating musical compositions with the help of artificial intelligence is Aiva Technologies. Its algorithms incorporate the concepts of music theory through researching and processing existing musical works. Even though some of the works created by Aiva have been used in films and marketing, nevertheless the musical compositions created by multifaceted aspect that encompasses authors reflect more accurately the inner feelings of the human being, aesthetic references, personal visions, the many aspects of the human universe, the strong point being inspiration, as a primary determinant of the artist. Traditional musical instruments remain an important support in the field of musical art, as they possess specific sounds and unique qualities, fully explored in the interpretative process, which is an important field that is equally integrated in the area of the definition of creativity. Attempting to create these sounds and effects with the help of artificial intelligence is a challenge in achieving perfect performances that could be evaluated at the same level as human ones. Therefore, predictions about the possibility of equalizing their value remain questionable, as the two require different criteria for analysis.

**Keywords:** AI, academic music, digitized composition, experimental research.

## 1. Introduction

Historical overview on the development of computer based music. Music and information technologies are currently defined by a wide range of topics, including those that illustrate the direct connection between music composition and computer science. A true musician recognizes that understanding the principles of sound formation, sound generation, timbral richness, and acoustic effects makes music more tangible, enhances creative imagination, and inspires inventive artistic experimentation. For those engaged in the creative process, it becomes crucial to comprehend and be able to perceive the mathematical,

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physical, and physiological analysis of musical sound. One aspect of comprehending the spiritual essence of the world is through music, which is the splendour mirrored in sound, which is regarded as a unique space with a distinctive knowledge area. Considering the emergence of fresh viewpoints on the creative process, artists and representatives of various disciplines are now focusing on the question of how information technologies operate in the sound formation domain of music.

Several years prior to the present-day technological advances, the New York Times acknowledged Lejaren Hiller's composition in his obituary in 1994 as the very first substantial musical masterpiece composed on a computer. Hiller began to consider how the algorithms may be used to simple musical counterpoint exercises after working with computers during studies concerning synthetic rubber. The four movements of the *Illiac Suite* were a collection of sophisticated experiments that replicated many historical genres of classical music, ranging from the Renaissance to Arnold Schoenberg's 12-tone serialism of the early twentieth century. The most significant pivot emerged with the fourth movement, completed in fall 1956, when Hiller applied Markov chains, a type of probability system in which the music was reliant entirely on the note that directly precedes it, with little or no capacity for the computer to assemble a central theme. After the early movements' plunked strings and twitching, chopped melodies, the fourth movement bursts and diffuses; it skips, stops, and again begins, boosting up the intensity as it approaches a succession of dead ends and cliffhangers. Hiller, dedicated to the integrity of his experiment, refused to modify what the computer produced, which added to the unpredictability (Gage, 2021).

The *Illiac Suite* stands today as a landmark piece in the development of the use of algorithmic thinking in music and experiment to a certain post-war epoch, one where structuralist philosophy could be combined with digital technology and rule-based, mathematical song writing techniques that date back as far as ancient times. This experimental method proves that the digitalized compositions may be a grasp of fresh, unexplored musical horizons, however their relevance and usability remain questionable. Computers can only recreate something that already exists by transforming it in an intriguing, more innovative form, which may seem unique at first glance, but truly it is just a variation of something that humans have previously come up with.

## **2. Experimental use of technologies in musical composition**

David Cope is an Emeritus Professor of Traditional Music and Composition at the University of California, Santa Cruz. He's written hundreds of pieces that have been performed all over the world, but he was facing a crisis in the early 1980s due to a severe lack of inspiration for the opera he'd been commissioned to write. Prior to that, he experimented with computers and

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programming, learning many computer languages including LISP, a language commonly used in artificial intelligence development. In order to conquer his motivational crisis, he decided to do an experiment using some of the algorithms he had learnt and create something that could generate music (Marr).

Based on the works Cope would upload to the program's database, Experiments in Musical Intelligence (EMI), the computer program would first deconstruct, analyse, and split the song into components. Then, scan through the work, look for patterns or motifs that represent the piece's style, and ultimately, reassemble the individual elements into new patterns. Cope started by uploading his own compositions and noticed patterns that he had never noticed before. That sparked his desire to improve his style. He began composing new works in the style of legendary composers utilising EMI since completing his opera eight years after receiving the commission, but just two days after finishing programming. Cope struggled to find a label to produce the music and human musicians to play it. He finally resorted to using the Disklavier, a form of piano that uses sensors, to perform the experimental works composed by EMI. However, critiques and reviews were not favourable (Marr).

Cope's experiment proves that humans' ability to perceive sound is very sensitive to acoustical changes in the compositional styles and can strictly delimit computer-based music from pieces written by actual musicians. Embracing modern technologies for composing musical pieces can be beneficial only when used with thorough control, since its use should play the role of a brainstorming machine that suggests new perspectives for the composer while not interfering with his own original ideas. Also, the AI generating music lacked high level authenticity in terms of emotional impact on the listeners, since a truly sensitive musical piece needs to derive from a real-life experience or an association from author's interior state of mind, which AI systems cannot simulate.

Another exploratory research effort on academic music composition using AI-based algorithm systems launched at Rutgers University. Ludwig van Beethoven died in 1827, at the age of 56, leaving his *10th symphony* incomplete. Beethoven left drawings in many formats, primarily musical sketches, but also written notes including some ideas. Only a few handwritten notes summarising his intentions for the work have survived, with the most consisting of unfinished ideas or fragments of motifs or harmonies. A diverse team of computer scientists at Rutgers University has now trained an artificial intelligence to replicate the great composer's style and then applied it to produce an entire symphony based on these first ideas (Goodyer, 2021)

Typically, classical composers start with a major subject and expand it over a couple of minutes before moving on to another theme. That's how

Beethoven and other classical artists initiate a theme and expand it, and that's specifically what the AI was required to learn. The experiment's main problem was training the AI to create captivating melodies based on one particular motif, because AI has to learn from a large amount of musical data in order to forecast what the next pitch would be depending on what has been previously recorded. Another problem is that if we only give AI an initial foundation and let it generate a forecast, it can anticipate a certain number of notes, but eventually it becomes nonsensical because it is no longer relevant to the centre theme. The challenge that arises regarding this point is: how can we empower the AI to remain focused on the primary theme while further developing it? This is where the purpose of the human expertise collaborating with AI begins to merge. The study team had to collaborate with human professionals to annotate and categorise a large amount of music in order to inform the AI what the central idea was and where it developed in a large amount of musical works. Furthermore, the AI was tasked to generate the music in a specified musical form. Whether you are writing a scherzo movement, a trio section of a movement, or a fugue, you must be familiar with each of these musical forms since they have a distinct structure. As a result, the AI had to comprehend how to produce a fugue, a trio, and a scherzo in order to apply their qualities in anticipating an upcoming musical line development (Goodyer, 2021).

The biggest constraint of this study was that Beethoven only created nine symphonies, which is a very modest dataset in comparison to what the AI required to process in order to provide correct results. This prompted the researchers to train their initial AI version as if it resembled someone living in the 18th century, listening to baroque music by Bach, Haydn, and Mozart. As a result, the original version of the AI was trained on the type of music that anyone living in that historical time period would learn to create. The next phase was to train it particular to Beethoven, specifically on earlier Beethoven sonatas, concertos, string quartets, rather than just symphonies. Also, the original experimental version was intended to create the composition as two lines of music, rather than as a whole symphony, as is usual of a composer's work – by just creating first and then arranging. The next step required AI developing the ability to orchestrate the entire arrangement (Goodyer, 2021).

This experiment is worth considering since it focuses on the intriguing benefits of having an AI that can process music and finish compositions or explore different musical perspectives. But on the other side of the spectrum, by using AI we risk denaturing the true style of real composers. A considerable advantage of the experimental use of machines for creating digitised compositions is that computers are able to capture the main rules and harmonies in melody through a statistically and mathematically implicit method and be able to use that to recreate something similar. However, the authenticity and capacity of compositions to transmit specific levels of emotion

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are altered, making such musical works less likely to be acknowledged by the academic music community.

### 3. Conclusions

Experimental research related to the application of information technologies in music composition has uncovered a wide range of new approaches, permitting to revolutionize academic music by enhancing both the experiences of the author and the listener. The deep metamorphosis triggered by the wide implementation of computer-based systems in the compositional process has raised awareness regarding the need of precise dosage of technological influence in order to diminish the risk of denaturation of the original thoughts and ideas of the composer.

Computers and electronics are shaping the music of the 21st century and have provided not only an alternative, but a very powerful additional tool and musical instrument with almost endless possibilities. AI is now capable of generating musical compositions and offering suggestions to composers, therefore saving time and expanding creative horizons for composers and musicologists.

The benefits of using AI in music creation go beyond just ease and accessibility. With its ability to learn and adapt, the technology has the potential to take the creative process to new heights. By bringing fresh perspectives and ideas to the table, AI can help musicians and songwriters break out of their creative ruts and explore new musical territory. With AI as their creative partner, musicians can experiment with new genres and styles, push the boundaries of their musical abilities, and explore new creative avenues they may never have considered before.

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