An Empirical Study Comparing the AI Music Generation Model with Electronic Music Composition Methods: a Multidimensional Analysis of Compositional Process, Quality and Efficiency

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Abstract. This study is concerned with AI-based music generation tools like OpenAI and Jukedeck as compared to music production techniques like Ableton Live. It examines these two types of production processes. The research offered a variety of composition tasks -from melody generation to building a song- as well as asked evaluations from experts and common at large audiences. It was revealed that experts and listeners revealed peculiar plusses and minuses of each developed method. Although AI tools are superior in terms of speed, electronic music production provides more space to the sound innovator since the art depth here goes along maximizing musicians' crave for originality. These insights not only guide musicians in selecting appropriate tools but also underscore the synergistic potential of combining AI and human creativity. Besides that, the research advances the discussion of "technology-enhanced art", a field that is being rooted to replace the traditional music model by the digital transformation. The developments may focus on hybrid workflows where AI inputs are nourished with human contributions, prompting innovative music creativity.

Keywords: AI music generation, electronic music composition, creative workflow, output quality

1 Introduction

AI is more rapidly developing than ever in history, and its influence on music composition is also noteworthy, as multiple AI music generation programs, for example, using the GPT-3 platform, are revolutionizing the music creation business[1]. At the same time, one of the major repercussions caused by DAWs was almost reaching the creator independence level and the creative process control. Despite the growing prevalence of both approaches, existing research predominantly examines them in isolation, lacking a comprehensive comparative analysis of AI-generated music and electronic composition techniques.

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This study addresses this gap by empirically investigating the distinctions between AI music generation models and electronic music composition methods across three dimensions: workflow, output quality, and efficiency. Specifically, it explores the following research questions: (1) How do the automation levels and interactive capabilities of AI tools compare to those of DAWs? (2) What are the differences in technical precision, artistic value, and listener reception between the two approaches? (3) Which method offers greater advantages in terms of time efficiency and resource utilization? Addressing these questions provides valuable insights for music creators in selecting appropriate tools[2].

The research aims to elucidate the strengths and limitations of AI and electronic music methods through empirical analysis, offering a scientific foundation for methodological choices in music production. Theoretically, this study contributes to the paradigm of "technology-enhanced art," enriching the discourse on music creation. Practically, it supports the music industry's digital transformation by enabling more diverse and efficient creative processes.

Existing literature on AI-generated content primarily focuses on algorithmic frameworks, such as the Transformer model, and specific applications, such as background music generation. In contrast, studies on electronic music emphasize technical features, including DAW modularity and creative flexibility. However, few studies systematically compare these approaches, particularly in terms of efficiency and quality. Building on prior research, this study provides a nuanced analysis of the similarities and differences between AI-driven and electronic music composition, offering fresh perspectives for both academic and practical endeavors.

In conclusion, this research not only bridges a critical gap in the literature but also advances the theoretical and practical understanding of music composition. Besides, it can support the music industry's evolution toward greater innovation and efficiency.

2 Research Methodology

2.1 Experimental Design

2.1.1 Sample Selection.

The chosen sample groups were varied in so far as they reflected the variety of demographics, which were presumably considered to provide the maximum contrasts between the two experimental ends. The groups were selected to ensure not only the representativeness but the comparability of the experiments. Another parameter which we tried to compare across the samples was the “use value” in this study.

(i) AI Models: Jukedeck and Amper Music from OpenAI were selected as the actual AI music generation samples[3]. These online platforms were selected for their technical sophistication and their operational presence in the market. OpenAI Jukedeck, an important achievement of OpenAI in the music industry, is renowned for its and its generative algorithms and versatility across various application scenarios. Nonetheless, Amper Music has established itself as the frontrunner in AI-driven music composition due to its well-performing algorithms and significant market share in the music industry. (ii) Electronic Music Software: Ableton Live and FL Studio were

chosen as such comparison examples, since they were traditional methods used in electronic music composition. These software packages were selected mainly for their comprehensive range of features and large number of users. Ableton Live has obtained success in the music production area for its intuitive interface, advanced audio editing tools, and massive plugin support[4]. Endlessly, FL Studio has earned its name in the industry because of its variable workflow, which allows for user adaptation, through a rich sound library, which is available to users all over the world[5].

2.1.2 Task Design.

In order to produce a detailed comparison on the subject of AI systems and electronic music software, on the issue of compositional process, work quality, and efficiency, the following study was designed in 3 separate tasks:

(i)Melody generation (Simple task): AI-derived systems and computerized music devices were provided with the same instruction which was producing a melody in a pre-defined musical style. By this task, we were interested in exploring redoubts of their epistemology in melody writing.

(ii)Harmonic arrangement (Medium task): Of a given melody, the AI systems and electronic music tools were instructed on scoring harmonizations. Yes, this activity was intended to check their ability to manage integration of ideas and present something creative in their own composition.

(iii) Full Arrangement (Complex Task):

The AI models and electronic music software were independently tasked with arranging a complete song, encompassing melody, harmony, rhythm, and other elements. This task aimed to comprehensively evaluate their performance in complex music creation scenarios.

To ensure the fairness of the experiment, all tasks were conducted within the same musical style (e.g., electronic dance music). Additionally, the material library and creation environment were standardized to minimize the influence of external factors on the results.

2.2 Data Collection

To ensure objectivity and comprehensiveness, this study employed multiple data collection methods, including creative process data and quality evaluation data.

2.2.1 Creative Process Data.

(i) Step Records:

The generation steps of the AI models and the manual operation paths in the electronic music software were meticulously documented. For AI models, the entire process from input to output was recorded. For electronic music software, each user operation within the software was tracked.

(ii) Time Statistics:

For each task, the time taken by the AI models to generate music and the time spent by users operating the software were recorded separately. This data was used to assess the efficiency of both approaches.

2.2.2 Quality Evaluation Data.

A clear set of professional and audience reviews is used to evaluate the quality of the developed works objectively.

(i) Professional Review: Ten musicologists were invited to justify the works using creativity and technical level. A five-point scale is used for scoring (1-5) to make the scoring objectivity.

(ii) Audience Feedback: From the 100 audience members surveyed through a web-based platform, the emotional projection and genre were the aspects focused on in the interviews. This is the same five-point criteria used in the ratings of the audience in order to provide insight based on the audience's perspective on the depicted works.

3 Results and Discussion

3.1 Comparison of Creative Process

As far as the creative process is concerned, AI music generation models and electronic music software tools show more than one significant difference[6]. As depicted in Table 1, creative process for AI music generation models components is composed of the linearly connecting elements: input parameters go to model generation, and resulting output is the final product (see Table 1). This is a highly mechanized approach that does not rely on human involvement at any stage. However, constitutive is the process of electronic music-making and consists of brews of materials choosing, engineering of tracks, the adjustment of effects, and mixing. This process is ongoing and recreates itself, which often comes back to the creator as a result of refining and optimizing work.

Table 1. Comparison Table of Creative Process Between AI music generation models and Electronic Music Composition Software.

Content	AI music generation models	Electronic music software
Step1	Enter the prompt word	Make a plan
Step2	Download the work	Material selection
Step3		Create the melody and the chord progress
Step4		Make the drums
Step5		Sound track editing
Step6		Effects adjustment
Step7		Make sound
Step8		Arrangement and structure
Step9		Mix and masterband processing
Step10		Cycle iteration and optimization
Step11		Download the work

These differences in process directly impact the efficiency and style of the output. The linear process of AI music generation models enhances efficiency, making them particularly suitable for standardized tasks requiring repetitive work, such as creating advertisement soundtracks. However, this efficiency comes with limitations, as the output may lack individuality and creativity. On the other hand, the iterative process of electronic music, though more time-consuming, offers creators greater freedom, enabling the production of more personalized and innovative works. This makes electronic music better suited for experimental music and other creative scenarios demanding a high degree of individuality. It can be concluded that the AI Composition Big Model is more suitable for the general public to create songs, while electronic music composition is more suitable for professional music creators to use.

3.2 Comparison of Work Quality

In terms of work quality, the outputs of AI music generation models and electronic music software were evaluated through professional reviews and audience feedback. The results of the data analysis are presented in Table 2. As shown in Table 2, electronic music scored higher in creativity and emotional expression, while AI music generation models excelled in technical proficiency.

Table 2. Comparison Table of Work Quality Between AI music generation models and Electronic Music Composition Software.

Content	AI music generation models	Electronic music software
Creativity	3.5/5	4.5/5
Emotional expression	3.8/5	4.1/5
Technicality	4.2/5	3.9/5

On this particular subject, electronic music had a really higher creativity score of AI music generation models, namely, 4.5/5, and the models could only be given 3.5. Hence, electronic music is best suited for creating personalized and worthwhile artistic activities and acting as a muse for composer. Interestingly, electronic music accounted for a score of 4.1, which was higher than AI music generation models, which had 3.8. Electronic music was, above all this, better no matter the context beyond the essentials of sending the listeners into the emotional spectrum. Accordingly, AI music creation models were given a score of 4.2/5 which is better than 3.9/5 that electronic music holds. Still, AI's creative expression and emotion remains an area to be improved upon (see Table 2).

These differences likely stem from the distinct characteristics of the two approaches. The AI music generation models hundreds AI generation methods with data, which help to obtain the exact and way their rhythm are repeated, but often not to fully express the emotions and creativity of them by human. Conversely, the electronic music technique imposes human emotion and creativity, which make people love to use their imagination with electronic music even more.

3.3 Comparison of Creative Efficiency

In terms of creative efficiency, AI music generation models and electronic music software also show notable differences. The results of the data analysis are presented in Table 3. As depicted in Table 3, in tasks such as melody generation and complete arrangement, AI music generation models required significantly less time than electronic music software.

Table 3. Comparison Table of Creative Efficiency Between AI music generation models and Electronic Music Composition Software.

Content	AI music generation models	Electronic music software
Melody generation task	5 *(mins)*	30 *(mins)*
Harmony arrangement task	10 *(mins)*	60 *(mins)*
Full arrangement task	20 *(mins)*	120 *(mins)*

For instance, in the melody generation task, AI music generation models completed the task in under 5 minutes, while electronic music software required at least 30 minutes. In the harmony arrangement task, AI models took approximately 10 minutes, compared to at least 60 minutes for electronic music software. In the full arrangement task, the AI model completed the task in only about 20 minutes, compared to at least 120 minutes for the electronic music software. This demonstrates that AI music generation models have a huge advantage in terms of efficiency, making them particularly suitable for scenarios where a large amount of music needs to be generated quickly, such as the festival scene (see Table 3).

However, it is important to note that creative efficiency is not the sole measure of work quality. While AI music generation models excel in efficiency, they still need improvement in creativity and emotional expression. When users are creating music, they should not just use AI music generation models to pursue quantity and neglect the quality of their works. A large number of AI music works with converging styles will only lead to the music market getting worse and worse.

3.4 Discussion

Based on the comparative analysis, it is evident that AI music generation models and electronic music software each possess distinct strengths and weaknesses, making them suitable for different creative contexts and requirements. AI music generation models excel in creative efficiency, particularly in scenarios requiring rapid production of a large volume of musical works, such as advertising soundtracks. On the other hand, electronic music software demonstrates superior capabilities in creativity and emotional expression, enabling the creation of more personalized and emotionally resonant works. This makes it particularly well-suited for experimental music and other creative endeavors demanding a high degree of individuality.Furthermore, several limitations of this study should be acknowledged. First, the research focuses on a

limited selection of representative AI music generation models and electronic music software, which may not comprehensively reflect the current market landscape. Second, while the evaluation of work quality incorporates professional reviews and listener feedback, these methods, despite their inherent objectivity, remain susceptible to subjective biases. Additionally, the study lacks the application of statistical methods such as T-tests and ANOVA (analysis of variance) for data analysis. Future research could address these limitations by expanding the sample size and refining evaluation methodologies to enhance the accuracy and reliability of the findings.In conclusion, this study offers valuable insights for music creators by examining the differences between AI music generation models and electronic music software in terms of compositional processes, work quality, and efficiency. As technology continues to advance and market dynamics evolve, these two approaches are likely to coexist, compete, and mutually inspire, thereby driving further innovation and development in the field of music creation.

4 Conclusion

This study shows that compared to electronic music composition, AI music generation models have a significant advantage in terms of compositional efficiency.They are able to generate a large number of musical compositions quickly to meet the need for rapid music generation. However, considering the creativity, so-called 'soul voice' of traditional electronic music composition methods, remain unrivaled. Because of the conventional structure of electronic music composition, creators are given ample opportunity to explore and experiment, eventually making personal music that they imprint with their emotional echoes.

Based on these findings, the following applications are proposed:

1. For scenarios requiring rapid generation of musical content, such as game sound effects or advertising soundtracks, AI music generation models are undoubtedly the preferred choice. The use of AI music generation models can greatly shorten the production cycle and can enable everyone to quickly generate some musical works.
2. For projects with high artistic requirements, such as album production or concert tracks, traditional electronic music composition methods will give creators more room for creativity. Creators are able to use their creativity to produce works with unique personal characteristics and strong expressive power based on their own experience and musical tastes.

As the pace of technological development increases, the relationship between AI and electronic music will also become closer. In future research, we could explore models of collaboration between AI and human creators, such as using AI for initial inspiration generation and then using AI to refine our inspiration. This hybrid approach has the potential to combine the efficiency of AI with the creative advantages of electronic music, further enabling improvements in the speed and quality of music production.

In addition, researchers can investigate the complementary nature of AI and electronic music, such as their respective user experiences in the creative process, which can lead to new possibilities for music creation. In the end, this study not only provides valuable insights and inspiration for music creators, but also outlines a roadmap for the future development of music creation technology. The fusion of artificial intelligence and electronic music is expected to open up new horizons and infinite possibilities in the field of music creation.

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