Application of artificial intelligence in music generation: a systematic review

Frank Manuel Gutiérrez Paitan, María Acuña Meléndez, Christian Ovalle
Departmento de Ingenieria, Universidad Tecnológica del Perú, Lima, Perú

Article Info

Article history:

Received Jan 3, 2024
Revised Feb 29, 2024
Accepted Mar 21, 2024

Keywords:

Artificial intelligence
Automation and simulation
Music generation
Music processing
Optimization algorithms
Systematic review

ABSTRACT

Our analysis explores the benefits of artificial intelligence (AI) in music generation, showcasing progress in electronic music, automatic music generation, evolution in music, contributions to music-related disciplines, specific studies, contributions to the renewal of western music, and hardware development and educational applications. The identified methods encompass neural networks, automation and simulation, neuroscience techniques, optimization algorithms, data analysis, and Bayesian models, computational algorithms, and music processing and audio analysis. These approaches signify the complexity and versatility of AI in music creation. The interdisciplinary impact is evident, extending into sound engineering, music therapy, and cognitive neuroscience. Robust frameworks for evaluation include Bayesian models, fractal metrics, and the statistical creator-evaluator. The global reach of this research underscores AI's transformative role in contemporary music, opening avenues for future interdisciplinary exploration and algorithmic enhancements.

Corresponding Author:

Christian Ovalle
Departmento de Ingenieria, Universidad Tecnológica del Perú
Lima, Perú
Email: dovalle@utp.edu.pe

1. INTRODUCTION

In recent times, there has been an increase in interest and development in the field of music creation [1]. Music is a fundamental part of human culture that has undergone a significant evolution over the centuries, adapting to different cultures, styles, and technologies [2]. In view of this, we must bear in mind that the complex task of generating musical chords has been tackled by different methods throughout history [3]. In addition, the combination of music theory with computational algorithms has made possible the creation of more accurate and adaptable methods of chord generation [4]. During the 1990s, approaches based on artificial intelligence (AI), such as expert systems and neural networks, have emerged [5]. In addition, the wide variety of musical styles has generated a demand for methods to generate chords that are flexible and capable of addressing diverse genres [6], therefore, the initial methods for generating chords were based on rules derived from musical knowledge [7]. In view of this, the generation of music through models has undergone a paradigm shift with advances in AI and machine learning (ML) [8]. These approaches were basically simple and had restrictions in terms of the diversity and expressiveness of the chords that they could produce [9], bearing in mind that, in the most recent decade, approaches that rely on ML, such as genetic algorithms and deep neural networks, have emerged [10]. Also, the use of deep learning strategies to produce a variety of content (sound track, tracks, and bases) is on the increase [11], in view of this, the incorporation of AI methods has radically transformed the production of chords, making possible the automatic generation of complicated harmonic sequences [8]. In particular the interactive creation of chords, which has opened up new possibilities in the collaboration between musicians and computer systems, enabling user participation in the creative process [12]. This analysis therefore investigates the historical trajectory of the techniques used to create chords, highlighting the fundamental contributions that have taken this field towards unexplored creative horizons [13]. In this context, as we move into the era of AI applied to music, chord creation emerges as an exciting and ever-changing area that merges human inventiveness with computational power [14].

2. METHOD

The methodology of the systematic review was developed with the objective of investigating information on the evolution of musical chord generation methods. For this purpose, searches were carried out considering quality criteria related to this topic. To carry out this research, the population, intervention, comparison, outcome (PICO) approach was applied. This method provides a specialized format for the formulation of the question, and its elements can be seen in the table corresponding to the PICO questionnaire [15], [16].

The PICO method is a valuable tool that assists researchers in identifying literature relevant to their research questions [17], in addition, we have also studied the principles of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement for the proper construction of the systematic review, which, according to the PRISMA statement, is achieved by using three stages: planning the review, carrying out the respective review and, finally, reporting on the review [18], it also makes it easier for researchers to communicate the results of their systematic reviews clearly and concisely. In this specific context, the application of the PICO approach will help to present the results of the systematic review in a structured and understandable way [19].

The integration of quality criteria in the searches is essential, as it guarantees the relevance and reliability of the studies selected in the systematic review [9], effective communication of results is also an essential element in systematic reviews, and adherence to the PICO approach simplifies the organized and understandable presentation of findings [20]. The focus on incorporating quality criteria during the searches not only ensures the choice of relevant studies but also reinforces the methodological basis of the systematic review, thus promoting the reliability and validity of the results obtained [21], in line with the above, the effectiveness of the systematic review methodology is supported by the application of the principles of the PRISMA statement. This ensures systematic planning and execution, as well as the transparent presentation of the information collected, following the three essential phases of the process [9].

2.1. Research questions

The interest in the development of music generation is evidenced in the literature, where methods are examined from their initial applications to the most current approaches [22]; recent studies have also analyzed the influence of technological advances on the evolution of music generation methods, highlighting the connection between technology and musical creativity [23], because of this, the elaboration of tables in a systematic review is essential to organize and synthesize the information collected. This process provides a clear view of the existing literature and facilitates the comparison of results between different studies [24]; on the other hand, the effectiveness of tables in a systematic review extends to the presentation of information clearly and concisely. This enables readers to quickly understand the breadth and variability of the included studies [25]. With this in mind, Table 1 presents the PICO question and its components, and Table 2 details the keywords used in the PICO tool.

Table 1. PICO question and its components

Question PICO
RQ: How has the generation of musical chords evolved over time and what are the key methods used in this evolution?
Components
RQ1: What were the first methods used for generating musical chords and how have they evolved over time?
RQ2: What technological advances have influenced the evolution of musical chord generation methods?
RQ3: What are the most commonly used contemporary methods for generating musical chords?
RQ4: How do these methods compare in terms of effectiveness and applicability in different musical genres?

2.2. Search strategy

In addition, the keywords used in formulating the search equation were chosen. This was done because only some words classified in the original search equation were used in the final formulation. This process aimed to optimize the search for documents that would provide more relevant information for our systematic review.

Table 3 details the elements of the PICO question, where P: “technology” OR “generation” OR “technological advances” OR “AI music generation,” I: “evolution” OR “contemporary methods” OR “applicability,” C: “music” OR “classical music” OR “ pop music,” O: generation, C: “musical.” Initially, the research was conducted using the search equation derived from these keywords, as shown in the search equation. After the search, “92” articles were identified in Scopus and “33” in PubMed.

Table 2. Keywords in the PICO tool

Keywords In Pico Tools		
P (Problem / Population)	Evolution of musical chords How has the generation of musical chords evolved over time and what are the key methods used in this evolution?	(ALL (history AND of AND chord AND generation OR early AND chord AND generation AND methods) AND ALL (impact AND evolution AND music))
I (Intervention)	Chord generation methods What were the initial methods for generating musical chords and what has been their impact on the evolution of this practice?	(ALL (technological AND advances OR technology AND in AND chord AND generation) AND ALL (influence AND evolution AND music))
C (Comparison)	Comparison of generation methods What technological advances have played a crucial role in the transformation of chord generation methods over time?	(ALL (contemporary AND chord AND generation AND methods OR current AND technologies AND in AND music) AND ALL (difference AND evolution AND music))
O (Results)	Efficiency of generation methods What are the most relevant and widely used chord generation methods today, and how do they differ from previous methods?	(ALL (efficacy AND applicability AND contemporary AND generation AND methods OR current AND technologies AND in AND music) AND ALL (musical AND genres AND music))
C (Context)	Musical genres, application in classical music, pop, and jazz. Historical context of music. How do contemporary methods compare in terms of effectiveness and applicability, especially in different musical genres?	(context OR application) AND (“musical genres” OR “classical music” OR “pop music” OR “jazz music”) AND (“historical context” OR “historical evolution”) AND music

Table 3. Search on data base

	Search Equation	TOTAL
SCOPUS	(TITLE-ABS-KEY (“technology” OR “generation” OR “technological advances” OR “generation of music with AI”) AND TITLE-ABS-KEY (“evolution” OR “contemporary methods” OR “applicability”) AND TITLE-ABS-KEY (“music” OR “classical music” OR “pop music”) AND TITLE-ABS-KEY (“generation”) AND TITLE-ABS-KEY (“musical”))	92
PUBMED	(“Technology” OR “generation” OR “technological advances” OR “AI”) AND (“evolution” OR “contemporary methods” OR “applicability”) AND (“music” OR “classical music” OR “musical”) AND (“musical”)	33
	TOTAL	125

Starting a systematic review with the accurate formulation of search equations is crucial to ensure the completeness and specificity of the research [26]. Therefore, the careful choice of keywords in a systematic search is essential to maximize the relevance and salience of the retrieved papers [27]. Therefore, to ensure that the articles considered in our research on how AI affects current music development are relevant and consistent, Table 4 was developed where the criteria used to determine which articles to include and which to exclude are presented.

Table 4. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
CI 1: Studies should specifically address the use of AI in the creation, production, or analysis of contemporary music.	CE 1: Papers not directly related to the use of AI in contemporary music are excluded.
CI 2: Papers should provide evidence or empirical analysis on the impact of AI on contemporary music.	CE 2: Exclude research that does not present relevant results or significant analysis on the role of AI in the evolution of contemporary music.
CI 3: Studies may come from a variety of disciplines, such as computer science, music, AI, or related fields, as long as they are directly related to the convergence of AI and contemporary music.	

A review of titles, summaries, or abstracts was carried out, and based on this review, 45 documents were excluded from Scopus and 12 documents from PubMed, mainly because they were not studies developed within the topic being focused on. According to the inclusion and exclusion criteria, 45 articles were considered appropriate, after separating 4 duplicate articles present in both databases results. After completing the selection of studies meeting the inclusion and exclusion criteria in several databases, such as Scopus and PubMed, a total of 45 papers were collected as part of the systematic review, as can be seen in Figure 1 in more detail.

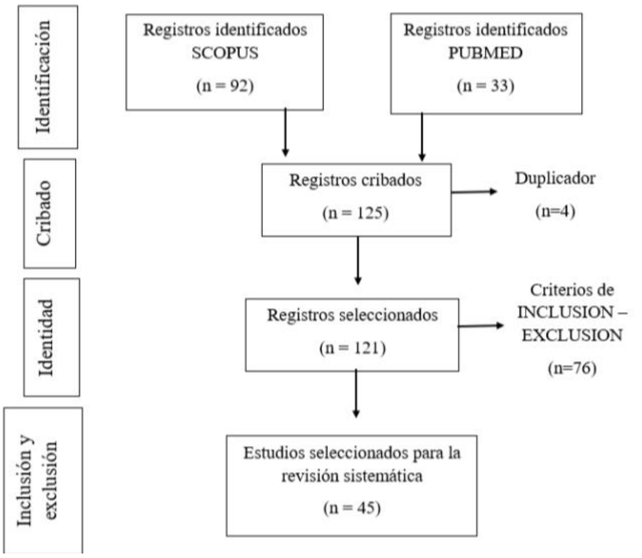

Figure 1. PRISMA flow chart

Based on the data provided in the Table 5, it is possible to identify the advantages derived from progress in the field of electronic music [28], automatic music creation [29]–[36], development in music [37]–[47], contributions to music and related fields [48]–[57]. Similarly, specific investigations and explorations have been carried out [58]–[70]. The importance of the contributions to the transformation of western music is also highlighted [71] and progress in the creation of educational programs and devices [72]. This perspective indicates that developments in electronic music not only have a direct influence on musical transformation [37]–[47] but also generate significant contributions to related fields [48]–[57]. The automated creation of music, as demonstrated in the mentions [29]–[36], has created new opportunities and has acted as a driver for the transformation of western music [71].

Table 5. Benefits obtained

#	Benefits	Implementation	Reference
1	Progress in electronic music	Optimization of artistic expression through technology	[28]
2	Automatic music generation	Facilitating creativity through automatic tools	[29]–[36]
3	Evolution in music	Adaptation to cultural and technological transformation	[37]–[47]
4	Contributions to music and related disciplines	Enrichment through connections between different disciplines	[48]–[57]
5	Specific studies and explorations	In-depth study of specific aspects to broaden knowledge	[58]–[70]
6	Contributions to the renewal of western music	Modernization of classical music with contemporary approaches	[71]
7	Hardware development and educational applications	Improving music education through technological tools	[72]

Special contributions to music and related fields [48]–[57] highlight the relevance of these advances in artistic and academic growth within the musical field. In addition, the detailed research and explorations of the [58]–[70] point to a constant dedication to research and the constant search for improvements in the field of electronic music. In addition, it is essential to highlight the importance of progress in the creation of educational devices and programs [72]. They not only promote technological advances in the field of music but also collaborate in the training and education of new talents in this field. Table 6 details the methods and models implemented, which play an important role in the evolution of this field. It is important to highlight the innovative models that have contributed to the musical transformation.

Table 6. Methods and models implemented

#	Method/Models	Reference
1	Neural networks	[28]–[30], [33], [42], [57], [64], [69], [71]
2	Automation and simulation	[34]–[36], [48], [49], [72]
3	Neuroscience techniques	[37], [38], [41], [53], [54], [56], [60], [70]
4	Optimization algorithms	[62], [67], [68]
5	Data analysis and bayesian models	[44], [50]–[52], [59]
6	Computational algorithms	[31], [32], [47], [61], [66]
7	Music processing and audio analysis	[39], [40], [44]–[46], [55], [58], [63], [65]

3. RESULTS AND DISCUSSION

In this part, a bibliometric review and a thorough analysis of previous research is presented. In the first section, the connections between the concepts of musical generation and understanding, as well as the visualization of density, are revealed. In the second part, the scientific gap identified between the papers suggested in this study is investigated, with the aim of elaborating an architectural model that facilitates the implementation of an algorithm to optimize and improve efficiency in the musical domain.

3.1. Bibliometric analysis

Bibliometrics is a field that employs statistical and mathematical approaches for the purpose of examining scientific production [73], in addition, bibliometrics is used to analyze the impact of research, identify trends in the development of science and technology, and evaluate the scientific productivity of researchers and institutions [74]. Therefore, bibliometric analysis emerges as a valuable tool not only for researchers but also for science administrators and policymakers. Its application contributes to enriching the understanding of scientific research and its influence on society [75].

In Figure 2, you can see the network map provided, which shows three groups or groups of thematic data that summarize significant relationships between key terms. In the first group, which focused on audio and music computing, words like “audio acoustics” and “computer music” are interconnected, suggesting a close link between acoustics and music creation through computer technologies. Furthermore, the presence of terms such as “fitness functions” and their connection with “evolutionary algorithms” and “genetic algorithms” indicates a relationship in the field of evolutionary algorithms and fitness functions. Likewise, connecting “user interfaces” with musical terms suggests the integration of user interfaces into musical applications.

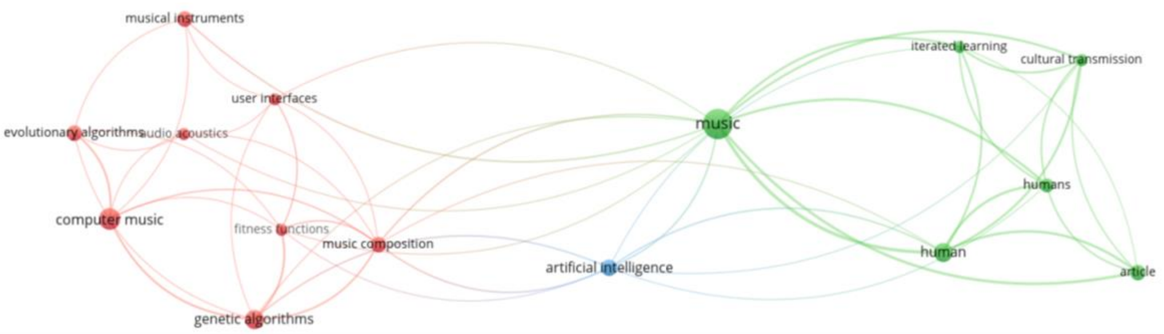

Figure 2. Linkages between common terms by bibliometric mapping

The second cluster, which encompasses social sciences and humanities, reveals remarkable connections. The keyword “article” acts as a central node connected to “cultural transmission”, “human”, “humans”, “iterated learning”, and “music”. This interweaving suggests that the articles address topics ranging from cultural transmission to music. The connection of “cultural transmission” with “human”, “humans”, and “iterated learning” reinforces the relationship between cultural transmission and human interaction. In addition, the connection of “music” con “human” y “humans” highlights a relationship between music and human studies. At the same time, “iterated learning” connects with “human” and “music”, highlighting its relationship with cultural evolution and music.

Lastly, the third cluster, focused on AI and evolutionary algorithms, shows that “artificial intelligence” is connected to “evolutionary algorithms”, “genetic algorithms”, and “fitness functions”. This points to an intrinsic relationship between AI and evolutionary algorithms. The connection between "evolutionary algorithms" and "genetic algorithms" indicates a close relationship in evolutionary computing. In addition, "genetic algorithms" are connected to "fitness functions" and "user interfaces", suggesting their application in the optimization of functions and user interfaces.

Figure 3 visually represents the density from a bibliometric analysis. It provides a quick and understandable view of the intensity and distribution of connections between bibliometric elements, contributing to decision-making in monitoring the temporal evolution of bibliometric interconnections. Artistic expression through music has undergone a captivating evolution over the centuries. From classical symphonies to contemporary rhythms, musical creativity has been influenced by diverse currents. In the modern era, it has undergone a unique transformation through the integration of AI. In exploring new musical possibilities, researchers have employed models based on recurrent neural networks [71], such as the algorithm Opt-aiNet NS [69], and the neural networks of long short-term memory (LSTM) [33], these techniques have enabled the generation of distinctive musical pieces and the exploration of previously unexplored soundscapes.

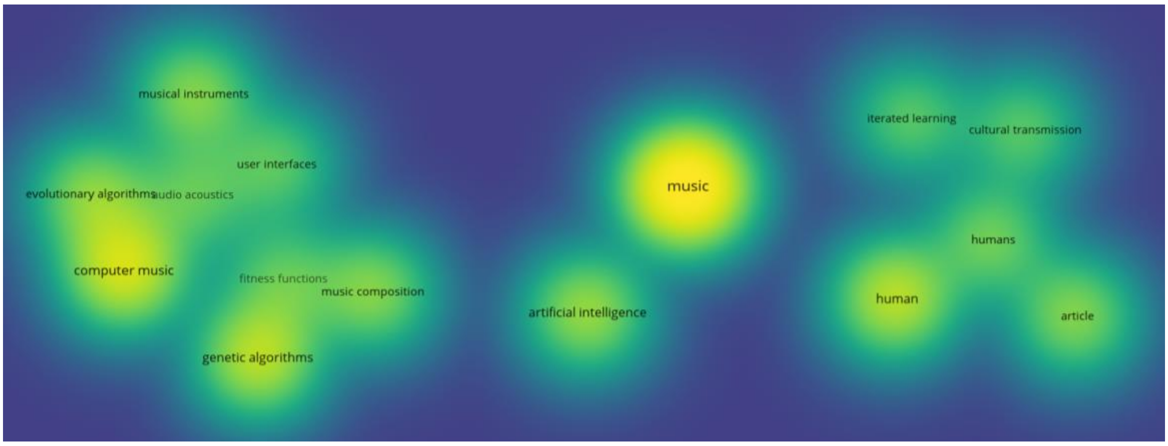

Figure 3. Visual representation of density from a bibliometric analysis

The incorporation of artificial neural networks and genetic algorithms [30], has elevated music production to an entirely different sphere. These methodologies, which take inspiration from biological evolution, make it possible to create music in an evolutionary way, adjusting and perfecting itself over time. Cellular automata, a dynamic paradigm at its core [72], have found their position in the application of AI to the field of music [48], its use in the interactive field of evolutionary generation [36] has led to the possibility of creative collaboration between the machine and the musician, resulting in unique and amazing musical creations.

The application of neuroscience methods, such as magnetoencephalography and electroencephalography [70], has given researchers the opportunity to explore the minds of musicians and gain a deeper understanding of creative processes. Neuroimaging techniques, such as functional magnetic resonance imaging and positron emission tomography, have been used for this purpose [53] and have become essential tools for investigating the connection between brain activity and music generation. The incorporation of algorithms such as hierarchical qualitative context [68], the particle swarm optimization method [67], and the multi-objective evolutionary method NSGA-II [62], has made possible a more effective optimization of musical production, resulting in the elaboration of compositions that stand out for their exceptional quality and complexity. With respect to evaluation and comparison, Bayesian models [59], the statistical creator-evaluator [44], and fractal metrics [50] have established a robust framework for evaluating the effectiveness and quality of parts generated using AI methods.

The combination between technology and music instruction has led to the development of a music education system implemented on the android platform [63], additionally, the first-order markov model [55], has proven to be a valuable resource for understanding and teaching musical organization, as well as the oral transmission of musical traditions [40], has discovered a new channel through digital content analysis. Computational approaches and simulations [66], the neuro dynamic code [61], and evolutionary approaches [47] have enabled musicians and creators to explore a wider range of opportunities, challenging the norms and taking music creation to new horizons. In short, the inclusion of AI in musical composition represents a benchmark in the evolution of this artistic manifestation. As we continue to explore new technologies and approaches, the musical realm will remain a breeding ground for innovation and creative expression.

3.2. Manuscript analysis

Two (2) databases containing research results were used in the initial phase of the search, resulting in the initial identification of a set of one hundred and twenty-five (125) documents. Subsequently, a purification process was carried out following the PRISMA methodology. This process included the elimination of duplicates and the exclusion of those documents that were not relevant to the research topic in question. As a result of this rigorous procedure, a final selection of forty-five (45) manuscripts was obtained, as detailed in Table 7. Phase 1 of this process focused on the initial search, while Phase 2 focused on the elimination of duplicates and the exclusion of manuscripts unrelated to the topic of interest. Phase 3 ultimately revealed the 45 manuscripts deemed relevant to the research.

Table 7. Results obtained from the search

Type of database	Name	Initial search	Final selection
Main database	Scopus	92	37
Secondary	PubMed	33	8
	Total	125	45

For a more detailed understanding of the distribution of these manuscripts, Figure 4 presents the breakdown of the number of manuscripts by each of the databases used, with Scopus being the main source with 37 manuscripts, maintaining the highest number after applying the filters. Likewise, PubMed contributed 8 relevant manuscripts. In addition, Figure 5 presents a line graph illustrating the annual distribution of manuscript publications, broken down by database and corresponding indexes. To provide a geographic perspective, Table 8 details the countries that have contributed the largest number of manuscripts in this study. This breakdown adds an additional layer of analysis, offering perspective on the geographic distribution of research on the topic under study.

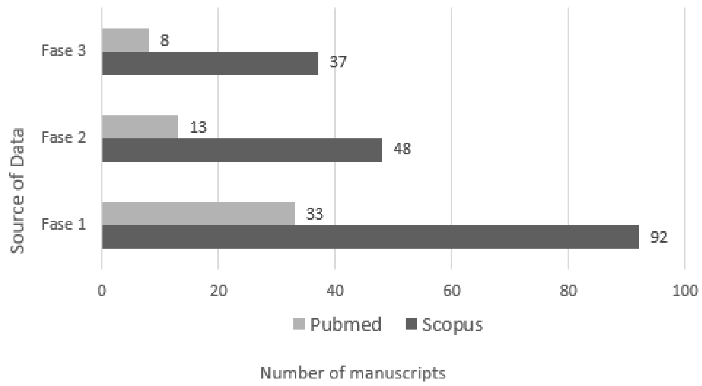

Figure 4. Number of documents in PRISMA phases

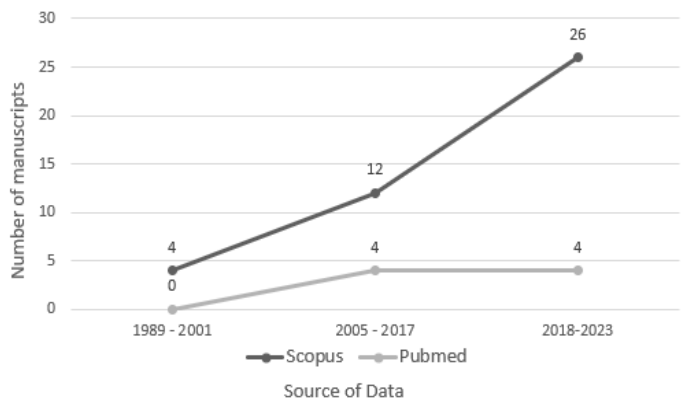

Figure 5. Document number by year of publication

Table 8. Documents by publication location

#	Country	Quantity	Reference
1	Brazil	2	[31], [72]
2	USA	18	[29], [32], [35], [37], [38], [41]–[43], [45], [46], [49], [50], [52], [53], [56], [57], [59], [70], [71]
3	Australia	2	[48], [69]
4	Portugal	1	[58]
5	Greece	1	[67]
6	Belgium	1	[66]
7	Russia	2	[39], [65]
8	China	2	[63], [64]
9	South Africa	1	[62]
10	Canada	2	[60], [61]
11	Argentina	1	[58]
12	Korea	1	[55]
13	Austria	1	[54]
14	Malasia	1	[51]
15	Japan	2	[44], [47]
16	United Kingdom	2	[28], [40]
17	Sweden	1	[36]
18	Ireland	1	[34]
19	India	1	[33]
20	Kuwait	1	[30]
	TOTAL	45	

3.3. Work on the benefits of music generation

Over the years, music has undergone significant change, mainly influenced by technological advances, especially in the field of electronic music, as evidenced in Table 9, these advances provide significant advantages [28], shaping the music industry and creating new opportunities for artistic expression [29]–[36]. The automated creation of music, as detailed in [29]–[36] is an innovation that redefines conventional composition techniques. This method enables the creation of unique works through the use of algorithms and AI, transforming in a revolutionary way the creative process for musicians and composers. The development of music, as recorded in [37]–[47], the influence of technological tools has had a significant impact on the evolution of music. From the introduction of synthesizers to digital audio workstations, these advances have expanded the variety of musical genres and styles.

Table 9. Studies show the benefits obtained

#	Benefits	Quantity	References
1	Progress in electronic music	1	[28]
2	Automatic music generation	8	[29]–[36]
3	Evolution in music	11	[37]–[47]
4	Contributions to music and related disciplines	10	[48]–[57]
5	Specific studies and explorations	13	[58]–[70]
6	Contributions to the renewal of western music	1	[71]
7	Hardware development and educational applications	1	[72]
	TOTAL	45	

The contributions of technology to the creation of music, as mentioned in [48]–[57], expand into other disciplines, such as sound engineering, music therapy, and cognitive neuroscience, generating a significant impact. Particular research and explorations, described in [58]–[70], have delved into music creation algorithms and their influence on musical aesthetics, offering significant insights into AI-generated music and its connection to human creativity. The impact of technology on the generation of music is not restricted to contemporary styles, as noted in [71]. It has played a pivotal role in revitalizing western musical traditions, preserving and renewing classical and historical forms. The advancement in hardware and educational applications, highlighted in [72], has extended the boundaries of technology for music creation, empowering musicians and facilitating music education. In conclusion, the advantages derived from technology for music creation, detailed in Table 9, are diverse and encompass different aspects, from the configuration of electronic music to the transformation of musical styles, thus inaugurating a new stage of creativity in music.

3.4. Work on the methods used in music generation

The progress of music creation through novel approaches has been significant, and the application of different techniques is evident in Table 10. Neural networks, cited in [28]–[30], [33], [42], [57], [64], [69],

[71], have emerged as a leading approach. These computational models replicate the structure of the human brain, enabling music generation through complex and adaptive patterns.

Table 10. Number of methods used with their manuscripts

#	Method	Quantity	References
1	Neural networks	9	[28]–[30], [33], [42], [57], [64], [69], [71]
2	Automation and simulation	6	[34]–[36], [48], [49], [72]
3	Neuroscience techniques	8	[37], [38], [41], [53], [54], [56], [60], [70]
4	Optimization algorithms	3	[62], [67], [68]
5	Data analysis and Bayesian models	5	[44], [50]–[52], [59]
6	Computational algorithms	5	[31], [32], [47], [61], [66]
7	Music processing and audio analysis	9	[39], [40], [44]–[46], [55], [58], [63], [65]
	TOTAL	45	

Automation and simulation, as highlighted in [34]–[36], [48], [49], [72], is another significant tactic in music creation. The use of automated algorithms and simulations effectively contributes to the production of musical compositions, thus exploring new creative opportunities. The neuroscience methodologies, registered in [37], [38], [41], [53], [54], [56], [60], [70], provide a unique approach to investigating the connection between music and brain activity. These methodologies offer significant insights into understanding how music impacts the human mind and is used in music creation.

Optimization algorithms, cited in [62], [67], [68], represent another crucial category. These algorithms seek to improve music creation by optimizing parameters, raising the quality and diversity of compositions. Data analysis and Bayesian modeling, explained in [44], [50]–[52], [59], is an approach based on probability and data analysis. These models provide a deeper understanding of musical structures and contribute to the generation of coherent and expressive music.

The computational algorithms, cited in [31], [32], [47], [61], [66], are essential tools in music creation. These algorithms range from traditional approaches to more sophisticated methods, offering versatility in music production. Music processing and audio analysis, as presented in [39], [40], [44]–[46], [55], [58], [63], [65], plays a vital role in extracting relevant information from music and audio data. This field encompasses techniques ranging from the analysis of musical features to the interpretation of audio signals, thus contributing to the creation of innovative music.

4. CONCLUSION

The meticulous systematic review of 125 papers, following an exhaustive search of key databases such as Scopus and PubMed, culminated in the final selection of 45 manuscripts. The geographical distribution of contributions highlights the preeminence of the United States with 18 manuscripts, followed by Brazil (2), Australia (2), and a diverse representation from countries such as Portugal, Greece, Belgium, Russia, China, South Africa, Canada, Argentina, Korea, Austria, Malaysia, Japan, United Kingdom, Sweden, Ireland, India, and Kuwait. This global reach underscores the breadth of research on the impact of AI on contemporary music. The variety of methods implemented, from neural networks to optimization algorithms and neuroscience techniques, highlights the complexity and versatility of the approaches adopted by the scientific community. In terms of benefits, seven (7) categories were identified, ranging from advancement in electronic music to hardware development and educational applications. These benefits translate into significant contributions to related disciplines, such as sound engineering, music therapy, and cognitive neuroscience. With an emphasis on the evaluation and comparison of the results, Bayesian models, fractal metrics, and the statistical creator-evaluator are highlighted as robust frameworks to evaluate the effectiveness and quality of the pieces generated by AI methods. In terms of number of methods used, nine (9) studies were found that employed neural networks, six (7) in automation and simulation, eight (8) in neuroscience techniques, three (3) in optimization algorithms, five (5) in data analysis and Bayesian models, five (5) in computational algorithms, and nine (9) in music processing and audio analysis. The research, supported by robust evaluation methods, highlights the integration of disciplines and persistent challenges. The conclusion underscores the transformation in artistic expression and the opening of new interdisciplinary avenues, consolidating AI as an innovative force in contemporary music and opening perspectives for future research and improvements in algorithm implementation.

ACKNOWLEDGMENTS

We would like to express gratitude to the Technological University of Peru, especially for providing with valuable support at every stage of this research. From the provision of bibliographic resources to access to specialized laboratories, their support and management have also been essential.

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BIOGRAPHIES OF AUTHORS

Frank Manuel Gutiérrez Paitan is a highly motivated, dedicated professional with a solid software development foundation. He is a software development technician from S.E.N.A.T.I. He is furthering his education as a Systems Engineering student at the Technological University of Peru, enhancing his skills and knowledge in the constantly evolving field of technology. His passion is programming, and he has successfully assumed the dynamic role of a full-stack developer at several companies. Specializing in Angular+ for front-end development has been a critical aspect of his experience, and he is currently honing his backend skills with a focus on NestJS. Eager to expand his knowledge, he is exploring areas such as Docker and A.W.S., envisioning a comprehensive skill set that spans the entire software development lifecycle. His background reflects a commitment to continuous learning and a drive to stay at the forefront of technological advancements, ensuring that he contribute meaningfully to the projects and teams he is involved with. He can be contacted at email: u20239818@utp.edu.pe.

María Acuña Meléndez is professor at the Faculty of Engineering of Engineering of the Technological University of Peru, Lima-Peru. She holds a Ph.D. in Systems Engineering. Her research areas are information systems and communications, as well as systems auditing and information security. She has participated in several research projects, as well as in thesis advising. She has registered several patents on software copyrights. Her research interests include information systems, data science, information security, data mining, artificial intelligence, and knowledge management among other related lines of research. She can be contacted at email: c21584@utp.edu.pe.

Christian Ovalle is an associate professor at the Faculty of Engineering of the Technological University of Peru, Lima-Peru. He has a Ph.D. in Systems Engineering with a specialization in artificial intelligence. His research areas are process mining, business data analysis, and pattern recognition. He is the CEO of the 7D consultancy dedicated to the Investigation of intelligent solutions. He has participated in different research projects, receiving awards from the Peruvian Ministry of Defense and the Armed Forces Army for the best general researcher, which is a technology-based company and his innovative products received national and international recognition. He has filed a number of patents and industrial designs on his innovative ideas. His research interests include data mining, artificial intelligence, image/signal processing, bibliometrics, and pattern recognition. He can be contacted at email: dovalle@utp.edu.pe.