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The Impact of Artificial Intellingence on Teaching Arts

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Chapter 1

Description of the topic

The unprecedented development of AI has had a significant impact on modern arts education. The use of AI into teaching techniques related to modern arts has created new opportunities for both educators and students, consequently transforming how modern arts are taught and comprehended.
Nowadays, aspects such as: [KY20] expanding the adaptability of AI-based art teaching, the improvement of teaching mode for the arts and the enhanced artistic experience and atmosphere of AI-based art teaching are taken into consideration.
Another subject of matter is how students perceive human artworks in comparison to AI-generated ones. [HC19]. The music education is also emphasized, as there is a strong influence provided by the AI tools that help music educators guide students to correct their errors in practice during the process of teaching-learning. [Sha19]
The general theme specifically focuses on how AI systems can assist people with improving piano performances. [Yan21].
Some of the analysed articles also highlight the undeniable impact of big data mining technology in art education and how the evaluation processes are influenced by this. Another area of interest on which there is only little related work is been aesthetic quantitative assessment of ink painting. [GW21]
On the plus side, a subtopic that is taken seriously into account is whether the usage of artificial intelligence in arts is fully ethical and if it may not arouse a lot of controversy. [L$^+$20].
The implementation of the SAILSS model (Supporting Arts Integrated Learning for Student Success) with the help of AI is also documented in [Sny14]. This has shown positive outcomes in improving student success in studying arts with the help of AI. The model provides professional development opportunities for teachers by including workshops, teaching labs, and arts integration programs. Through qualitative and quantitative research, it has been observed that the model correlates with increased student achievement, a significant decrease in discipline referrals and a positive change in school climate as commonly felt by both teachers and students.

Chapter 2

Critical analysis of articles

2.1 Literature review

The current state of measuring AI's performance in teaching modern art is covered in [KY20], with a focus on the algorithm utilized for performance analysis. The authors sought the advice of specialists when choosing performance metrics for art teaching, including mode, technique, content, atmosphere, means, effect, and environment. The analytical procedure involves creating a weight judgment matrix and applying the Analytic Hierarchy Process (AHP) to determine the weighting order for the performance metrics. The formula was used to calculate the weighted gray correlation degree of all indicators for a given performance degree in order to identify the performance degree that was closest for a specific object. The matrix of performance indicators is shown in Figure 2.1. Decision tree techniques like ID3 is created by picking attributes from a table, segmenting the training set into subsets depending on attribute values, and repeating the procedure recursively until the attribute list is empty.[Lon18] On the other hand, the ID3 learning algorithm chooses

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 2 \\ 1 & 1 & 2 & 1/3 & 1/3 & 1/2 & 1/2 \\ 1 & 1/2 & 1 & 1 & 1/2 & 1/3 & 1/3 \\ 1 & 3 & 2 & 1 & 1/3 & 1/3 & 1/2 \\ 1 & 3 & 2 & 3 & 1 & 1/3 & 3 \\ 1 & 2 & 3 & 3 & 3 & 1 & 3 \\ 1/2 & 2 & 3 & 2 & 1/3 & 1/3 & 1 \end{bmatrix}$$

Figure 2.1: The matrix of performance indicators

$$f = \sum (x - 1 \cdot T_{st}) + \sum \text{avg}\,(T)^2,$$

$$F = \min \sum f + \sum T_{\text{std}} \in \text{o}\,(1, \vartheta)\,,$$

$$\rho = (\text{start}) - T_{\text{std}}\,(\text{end}) + \sum F > \theta.$$

Figure 2.2: Evaluation function for the Music Notation Algorithm

attributes for decision tree construction based on the idea of information gain using information entropy, a measure of information in a system. The ID3 technique employs a method that involves building decision tree nodes recursively, reclassifying samples, and creating leaf nodes based on the highest class occurrence. These algorithms were used in experiments showing that the information acquired from the sketching test project was highest, highlighting its importance in differentiating artistic accomplishments. It had an impact on how well the art generalization project performed, with a prediction accuracy of almost 96%. The association between sketching and the results of art learning was demonstrated by the 88% accuracy of general art introduction predictions made using passing grades in sketching and art history.

According to [GW21] a CNN model is created in the study to predict the aesthetic ratings for ink paintings. The network infrastructure involves starting with a pretrained VGG16 model and modifying it by including a subject matter convolutional layer, swapping the classification layer for a regression layer, and lowering the number of neurons in connected layers to prevent overfitting and promote cascading.

In [Yan21] the algortihm that is presented is called Music Automatic Notation. The use of the casting hypothesis method to address the global deficit and make use of speed are the central components of the algorithm. It suggests an ARM-based (Advanced RISC Machine) and SA algorithm-based music-assisted learning system (SA). The evaluation index f [21] and the variable T are combined to form an evaluation function, as shown in Figure 2.2.

The algorithm is used as a standard point that delays code judgment to reduce complexity when evaluating the player performance. In music, this algorithm needs to asses technicality, individual key correctness, variances in keys, timing, duration and other criteria, which would be more difficult to be accomplished by teachers and instructors.

Figure 2.3: The AICAN-generated images

Real Identity	Attributed Identity	*M*	SD	*N*
AI artist	AI artist	3.10	0.65	75
	Human artist	3.09	0.57	80
Human artist	AI artist	3.18	0.62	59
	Human artist	3.27	0.54	74

Figure 2.4: The descriptive statistic Human vs AI

In the article [ME19], we are presented with AICAN, a AI artist tool that was developed to research the creative process in the arts. The model replicates how artists assimilate earlier works and eventually break free from established styles to produce new ones. This is accomplished via a "creative adversarial network (CAN)" that achieves a balance between the aesthetic conventions and the stylistic ambiguity to produce innovative art. The CAN network has a generator that maximizes stylistic ambiguity while minimizing deviations from the original art. As an experiment, the algorithm was used to generate a lot of images with the help of AICAN and then they were exhibited in order to see if people can tell if they are AI-generated or human-made, thus a Turin visual test being devised. As a result, 75% of the beholders thought the images belonged to humans. Some of the AICAN-generated images are shown in the Figure 2.3 Another article that focuses on the way in which people perceive artworks - whether they are AI generated or human-based, is [**?**] that shows how 330 people were initially signed up for the study. However, some were kicked out for failing to respond to survey questions . This led to a final sample of 288 participants of different ages. Based on the attributed identities of artists (AI vs. human) and the identities of artists (AI vs. human), the participants were split into four groups. Participants in the "attributed-AI group" were informed that the photographs in their group were produced by AI before viewing a set of six either created by AI or by humans. Using numerous t-tests, the experiment has summarised the statistical description of the survey as illustrated in Figure 2.5

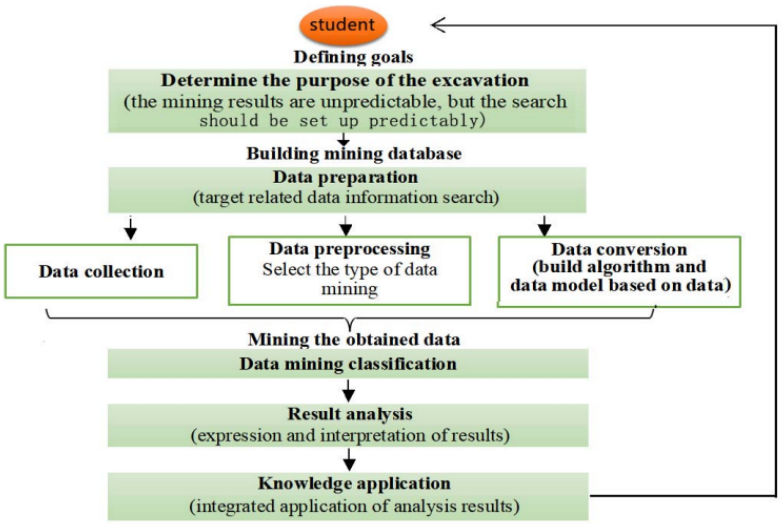

Figure 2.5: The model propsed by data mining in art education

Furthermore, according to [Wan20] the importance of data mining in teaching modern arts is undoubted. More specifically, data mining is the process of applying algorithms to extract hidden information from massive datasets using cloud computing, machine learning, statistics, and artificial intelligence. How exactly it impacts the art education? It plays a vital role in education systems by enabling personalized knowledge bases, customized courses and improved learning efficiency through the integration of new Internet technology, artificial intelligence and big data platforms. A better example of this fact is depicted in the chart of the Figure 2.4.

2.2 State of the art

In line with [KY20], in education and the arts, conventional electrical devices like recorders and projectors are frequently used. They increase learning engagement. The use of AI in art education tries to improve the learning experience, but is constrained by the lack of AI hardware. Traditional Computer Aided Instruction (CAI) enhances art teaching, but lacks individual understanding and active student participation. AI integration with multimedia technology can provide stronger technical support for modern teaching, enabling personalized guidance and active student involvement. Traditional Computer Aided Instruction (CAI) improves the teaching of art, but it lacks individual understanding and active student participation. By combining AI with multimedia technology, modern teaching can benefit from improved technical assistance, allowing for individualized instruction and engaged student participation.

As a current state of AI development in the field of teaching modern arts, the article

[GW21] proposes an adaptive computational aesthetic evaluation framework for ink painting in colleges and universities with the help of CNN that was previously discussed. It builds a benchmark dataset using deep learning techniques and extracts deep aesthetic attributes from ink painting images. The findings of the trial indicate that the deep aesthetic elements perform better than conventional hand-designed features. This paper provides a framework for deep learning-based computational aesthetic evaluation of art in addition to serving as an important resource for the success of AI-based art instruction in higher education.
Plus, information technology has advanced a lot in colleges and universities due to the rapid development of computer and network technologies. Software created especially for classroom instruction is quite rare particularly in the field of art education. However, in [Lon18] the way in which data mining with the help of ID3 algorithms create a wide range of benefits for art education is deeply explored. Precisely, art test scores can be analysed with data mining to generate the characteristic information of existing values, thus the efforts of teachers being reduced.
As for [Wan20], the core of smart education in arts but not only is online learning, which allows independent learning, optimal resource use, and interactive learning. However, there are still issues with online learning, such as a lack of systematic teaching, continuity, efficient communication and group practice. The effectiveness and personalisation of online education can be improved by using AI-based technologies, such as speech recognition and large data mining, to address these problems by offering voice narration, tailored course recommendations and knowledge base analysis for students.
As an innovative current state of AI in arts, generative adversarial networks (GANs) have become a great tool.[ME19] Programming-based art known as algorithmic art has influenced the notion of art to include non-artistic things and immaterial creations. A new generation of algorithmic art, however, has been inspired by the recent advancement of GANs and comprises AI to learn aesthetics from existing photos and create new ones based on that knowledge. Many times, people are unable to tell if they are created by humans or generated with AI tools.
Another topic concerning the state of the art is related to the ethical aspects of using AI in the field of arts. According to [L$^+$20], in the present the use of artificial intelligence in the arts creates significant ethical questions that call for more study. As AI becomes more common, it will be necessary to identify the features of artworks, reconise intellectual property rights and evaluate artistic genres and trends. At the moment, AI art is mostly focused on serving technology. In order to control and promote artistic works and assure the normative development of the art market, there is still a lack of ethical research in the field of AI art.
In the specific field of music education [**?**], the innovation of the AI usage is proved

by the existence of music synthesizers which have existed since the 1960s. However, they improved a lot ever since. These devices include smart features and benefits like the ability to save different tones and enhance the learning environment in the classroom. More sophisticated synthesizers have developed over time, enabling musical composition, polyphony and even sound simulation. They have transformed music education by promoting individual expression and improved assessment. Intelligent tools have gained acceptance and are frequently used in schools to improve theoretical understanding and flexibility. Technology has advanced to the point where music software and applications are now important tools in music education, offering better approaches to instruction.

On an even more specific level, for the field of computerised music notation algorithms [Yan21] and artificial intelligence-assisted piano performance, data mining is significant because it helps to extract meaningful information from big, imperfect and noisy datasets. AI information retrieval systems must use effective data replacement and retrieval techniques in order to analyse and respond to things beyond the recorded ones. Data preprocessing and sample collection are necessary for the data mining workflow, which incorporates statistical data feature clustering and evaluation based on clustering results. The improvement of students' musical capabilities and teachers' instructional skills depends on evaluation and assessment in the music classroom, yet the current evaluation processes lack impartiality. Thus, it is essential to create new learning models and concepts for scientific evaluation employing tools and platforms.

Chapter 3

Conclusions and further researches

In conclusion, even though at a first glance the connection between AI and arts and more specifically teaching them could seem a far-fetched, the comparison of the articles proves that the impact of it is quite obvious. Thus, it can be stated that artificial intelligence in art education poses both advantages and drawbacks. Various facets of arts education have undergone an evolution because of the AI introduction, which has improved learning and broadened creative possibilities. Students and teachers now have access to innovative resources, tailored learning experiences and cutting-edge means of artistic expression thanks to AI-powered tools and platforms. Not to mention that the way of evaluation with the automated tools simply changes the perspective of traditional assessment. AI tools can explore students' artistic work, offering precise feedback on techniques, composition and style. This personalized guidance enables students to refine their skills and receive targeted support, fostering their artistic growth. Furthermore, AI can adapt to the unique learning styles and preferences of each student, maximizing their potential for creative expression.

The impact of artificial intelligence on the education of the arts is an area that has a number of intriguing directions for future research. Some potential ones include pedagogical techniques. The should look at the best ways to include AI tools into the teaching of the arts. Understanding how AI can assist various learning styles, boost critical thinking and creativity are all part of this. The development of AI-driven teaching strategies that enhance the educational experience for both students and teachers can be the subject of future research. Another question that could be researched is how much technological background do both students and teachers need to let AI interfere with their day-to-day activity. Last but not least, examining the ethical ramifications of AI in arts education in greater detail. For the purpose of ensuring fairness, transparency and cultural sensitivity in the integration of AI in arts education, research can assist define ethical principles and best practices.

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