

Application of Artificial Intelligence in Modern Art Teaching

<https://doi.org/10.3991/ijet.v15i13.15351>

Fanwen Kong

Shandong University (Weihai) Art College, Weihai, China
kongfw123@126.com

Abstract—Despite its rapid development, the artificial intelligence (AI) has not been deeply applied in art teaching. Hence, this paper attempts to design strategies for applying AI in art teaching. For this purpose, the authors reviewed the current application status of AI in art teaching and summed up the problems with these applications. Next, the promotive role of AI in art teaching was analyzed in detail, and three strategies were developed to promote AI applications in modern art teaching, namely: expand the adaptability of AI-based art teaching; improve the intelligent teaching mode of art teaching; and enhance the artistic experience and atmosphere of AI-based art teaching. At the same time, to evaluate the application effect of AI in art teaching, a performance analysis model was designed based on analytical hierarchy process (AHP) and grey clustering. The proposed model can quantify the application effect of AI in art teaching, and it has a good application potential.

Keywords—Art teaching; artificial intelligence (AI); higher education; analytical hierarchy process (AHP); gray clustering

1 Introduction

With the rapid development of AI, its application in engineering field is becoming increasingly extensive; AI not only improves the design quality and efficiency of engineering projects, but also provides useful help for the improvement of the engineering design modes [1-3]. Especially in the field of higher education, due to the urgent demand for senior professional talents, AI has been gradually applied in the teaching process of higher education, playing a promotive role in the knowledge transfer of senior talents and the cultivation of their professional literacies [4-5]. Art education is a very important part of higher education. The process of art teaching involves the transmission of a good number of professional knowledge points, especially for the lecturing of skills or techniques that are highly professional, the traditional mode of art teaching cannot clearly shows the key points or links in art teaching, therefore, it needs the assistance of AI for art teaching. At present, some scholars have carried out related research, such as Tang and He [6] conducted research on how art major in higher vocational schools carries out entrepreneurship and employment education in the era of AI. Jin [7] analyzed how to apply AI in music education and its

development trend. Ahmad and Ghapar [8] took the higher education in Malaysia as an example to analyze the impact of AI on self-exploration education and its challenges. Wan [9] discussed the application-oriented talent training mode of broadcasting and hosting major in the era of AI. Li [10] explored the application of AI in music education. Chassignol et al. [11] discussed the trend of AI in education. Casazza and Gioppo [12] discussed the role of AI in the creation of screenplay.

However, most of the existing studies focus on the implementation details of AI application in art education, or on the specific execution problems in a certain link of art teaching or creation process, while neglecting the overall systematic planning of AI application in art teaching, and this has resulted in that the research on the application effect of AI in art teaching is not comprehensive enough, thereby compromising the implementation of the holistic strategies. To this end, through inductive analysis, and based on the correlation between AI and higher education [13-15], this paper analyzes the application of AI in modern art education from the two aspects of strategy analysis and model construction. The content of this paper includes 6 parts: the first part summarizes existing studies on the competitiveness of higher education; the second part analyzes the current status of the application of AI in art teaching; the third part analyzes the promotive role of AI in art teaching; the fourth part discusses the strategies of AI application in modern art teaching; the fifth part analyzes the application performance of AI in modern art teaching; the sixth part gives the conclusion.

2 Current Status of AI Application in art Teaching

2.1 Shortage of AI hardware facilities in art teaching

Traditional electronic equipment such as recorders and projectors are the most commonly used electronic means in modern education, these devices are also used in domestic art education. Teachers can use pictures, videos, and other forms to make art knowledge more vivid and alive. Taking music education as an example, with the help of traditional electronic equipment, students could learn knowledge more systematically and quickly, such education method can increase the number of learners, teach more content within a given time, and increase the efficiency of teachers. The goal of applying AI in art teaching is to present art knowledge to students in a more intuitive way, create a better learning atmosphere, exhibit design works that combined art and technology, help students enter the creation world of the artists, make students truly immerse in the masterworks of great artists, break the limits of time and place, and enable viewers to observe the details of art works more intuitively. However, due to the shortage in AI hardware facilities in art teaching, the desired art teaching effects or teaching goals can hardly be achieved.

2.2 Weak support of AI software technology in art teaching

At present, the commonly-used Computer Aided Instruction (CAI) comprehensively applies computer technologies such as multimedia, hypertext, artificial intelligence, network communication, and knowledge base to overcome the shortcomings of traditional art teaching in single and one-sided teaching scenarios. It can effectively shorten the learning time of art education, improve the teaching quality and efficiency, and realize the optimal teaching goals. According to surveys, there are many cases of AI applications in education in the United States, for example: there're self-adaptive learning systems for college teachers and students; there're teaching materials that can interact with students and change the content of the course according to the students' answers in random tests; there're intelligent textbooks customized according to students' personalized requirements; and there're cases that conduct more proper designs on the interface according to image analysis to improve user experiences, etc. Although traditional CAI has improved students' learning efficiency and enthusiasm to a certain extent, it does not fully understand the students' learning situations and can't vary with each individual, and it couldn't make sure every student would participate in teaching actively. Therefore, if we want students to be more actively involved in the teaching process, and if we want to collect individual students' learning conditions and give different guidance accordingly through human-computer interaction, then it's necessary to make technical breakthroughs in AI combining multimedia technology and provide stronger technical support for modern teaching.

2.3 Incomplete art teaching mode based on AI

At present, AI-based art teaching mode of colleges and universities mainly teaches the art teaching content with the help of Internet technology and online platforms. In this process, various education apps and online education websites have emerged continuously, such as MOOC (Massive Open Online Course), Micro-lecture online videos (Vko.cn), flipped classroom, Rain Classroom (Yuketang.cn), PAD class (PAD stands for presentation, assimilation and discussion), Tencent class (ke.qq.com), and Dingding class, etc. This teaching mode innovates the interactive cognition process of teaching, and it supports multiple functions such as play, pause, and slow play, etc., which enables students to use scattered time for learning and effectively control the learning speed; at the same time, it breaks the limit of locations, effectively solve the shortcomings of the traditional offline teaching mode, and largely increase the utilization rate of teachers. However, this art teaching mode has ignored the sense of experience and integrity emphasized in art teaching, especially when there are a large number of students, and art teachers and students can only teach and learn the art knowledge through the one-on-one form, which can't provide an artistic teaching atmosphere for students. In addition, since the AI technology is not mature enough, the AI-based art teaching mode could not meet the intelligent teaching requirements, which has resulted in a disconnection between the modern art teaching concept and the intelligent teaching mode.

2.4 Immature AI application in art teaching

At current stage, the development of AI technology is not mature enough. Technologies such as student emotion perception technology, simulated art teacher technology, intelligent learning companion technology, and other technologies that people wish to achieve in the field of art teaching are still under exploration. AI can help people to some extent, but it can't replace our thoughts, which is exactly the unique value of human beings. Modern AI art education can't perfectly achieve semantic analysis, sentiment analysis and symbolic analysis. Art forms are diversified and ever-changing with the times, but the essence of art won't change. In terms of creation and appreciation, art works are generally based on subjective thinking, therefore, in terms of aesthetic appreciation, AI is deficient in the evaluation of the art works of students. The current AI-based art teaching is only a simple realization of individualized spaces, it just uses computers to achieve basic art teaching, and cannot reflect the advantages of AI application in art education. Only by breaking the bottleneck of the combination of AI and art education can we exert the great potential of AI, so as to make it better serve our art teaching and learning.

3 The Promotive Role of AI in Art Teaching

3.1 Improve the learning effect of art students

The application of AI in art teaching can effectively improve the teaching quality, this is because AI studies the mechanisms of human activities and how to use machines to simulate these activities, so as to provide convenience for students to understand and master the knowledge they have learned. The AI education system simulates the thinking mechanism of human experts when solving complex problems, which can improve students' ability in logical thinking, and achieve the purpose of training students' ability in thinking from multiple angles and their artistic creation level. The AI-based art teaching system can teach according to students' aptitudes. Based on the database of students' personal information, cognitive characteristics, learning records, location information, social media information, and other information, the AI program can conduct self-learning, construct models of the learners, constantly enlarge and update the datasets, and adjust and optimize the parameters of the models; according to the different needs of students, AI program can push personalized resources, learning paths and learning services to students; through various communication tools, it can also conduct effective teacher-student or human-computer interactions, provide rich information sources and a good navigation structure, as well as intelligently guide students to learn, and give suggestions about their further study content. By applying AI to art education, we can release students' imagination space; AI could process, classify and organize the art knowledge, systematically divide the knowledge according to the habits of students, and help them build their own art knowledge base; it can improve students' learning efficiency, further

reduce their physical labor and work tasks, enable them to have more practical experience within less time spent, thereby creating better art works.

3.2 Enrich the teaching methods of art teachers

In the era of AI, we usually use computers as tools to master learning methods more effectively, to learn from the practice, to cultivate students' abilities in creation and problem-solving through heuristic education, and to build up collaborative learning relationships between people, and between human and computer. Therefore, the role of art teachers should be altered as well, they are no longer the content provider, but the teaching organizer or the teaching technology engineer. Art teachers are always the core of the teaching process, they need to innovate constantly and make good use of the AI technology to further improve the teaching efficiency of teachers and the learning experience of learners. AI can act as an assistant to the teachers, with the help of AI, teachers can actively arrange teaching content according to the teaching objects, and the learners can acquire learning content that is suitable for one's own cognitive ability. When students are learning, the AI assistant would also give feedback to the teacher about the problems of each student and the learning situation of the entire class. AI assistant can also undertake tasks such as decision support, answering questions, and correcting homework, etc.; so that art teachers could be freed from the tedious teaching works and put more efforts in the design of innovative teaching activities, pay attention to students' development, and cultivate their learning ability at a higher cognitive level. In the process of cultivating students' high-level abilities, art teachers and students interact directly, moreover, AI assistant could help teachers achieve one-on-one problem discovery and mutual improvement, so that art teachers can understand their problems in teaching, and conduct teaching research in an accurate and targeted way. AI robots can also play the role of students, help the normal school students and the teachers with their teaching skills; when taping videos for open classes, they can make teachers adapt to the recording environment more quickly, and enrich the forms of the video.

3.3 Improve the art teaching environment

The environment of art teaching is complex, it's often composed of many different elements. Generally, there are two kinds of definitions for art teaching environment: the broad sense art teaching environment refers to all conditions affecting the art teaching activities in schools, such as the physical environment and psychological environment; in the narrow sense, it means all conditions within the art classes that affect art teaching, such as teacher-student relationship, class size, and class atmosphere, etc. The intelligent presentation of art teaching content mainly includes two aspects: the visual presentation and the auditory presentation. The visual aspect involves multiple factors such as definition, field of view, brightness, and angle of view, and the information displayed through electronic means should be easily and clearly seen by all students in the classroom. In terms of the auditory aspect, a good listening environment can ensure smooth language communication and facilitate interaction

between teachers and students. The intelligent teaching venue can not only display the content clearly, but also make the presentation method more suitable for the cognitive characteristics of learners, and enhance their understanding and processing of the learning materials. The hierarchy of the spatial layout provides a basic guarantee for personalized teaching and learning supported by the AI technology. By building up partitions to form separate spaces, diversified learning activities could be conducted at the same time, while ensuring the asynchronous activities of individuals or groups, the mutual interference could be effectively reduced, and this is especially useful since students usually need to carry out group brainstorming and other activities during art teaching. In addition, the temperature, humidity, light, color and furnishings such as tables and chairs in the teaching environment can be configured according to the needs of different students or designed according to the requirement of the interactive experience between teachers and students. The combination of AI and teaching environment can not only provide a good user experience for teachers and students, but also perceive the learning status of students and adjust the push strategy in real time. The smart teaching environment can track, record and store the interaction trajectory of any individual in the space environment in real time, and provide data support for students' self-evaluation and teachers' decision-making.

3.4 Improve art teaching methods

In art teaching, by combining AI with art, we can use advanced digital media for art teaching, enabling students to obtain good visual experience and deepen their understandings and memorization of the art works. In the past, people could only rely on their eyes when appreciating digital media art works, but now, with the help of science and technology, all of our senses could be mobilized to enjoy these works, as a result, the authenticity of the works is enhanced and people would have more real feelings. The AI using VR fully draws on the characteristics of VR to add more interests to people's experience, so that they could have a better understanding of the intentions of the creators and their art works. As a teaching method, VR can create more ideal conditions for the creation of digital media art creators. For example, art teachers can use VR to teach and guide students, change their cognitive behaviors, and enable them to brainstorm more pleasantly. Under different historical backgrounds, people's cognitive methods would vary a lot; driven by information technology, VR, and AI, the logical thinking and space-time concepts of art creators have undergone major changes, by introducing these technologies into teaching, students could jump out of the scope of traditional learning mode, and find new learning methods to know things.

3.5 Improve art teaching evaluation forms

In the context of AI, the evaluation of art teaching should focus on the influence of the disruptive innovation of AI on related factors that are beneficial to learning. The application of AI makes personalized learning evaluation possible. By using big data to record all online learning behaviors such as interactions between teachers and stu-

dents, students' answering questions, teachers' evaluations, and learning paths, etc., we can accurately analyze the students' learning performance, and thus realizing procedural and personalized evaluations of students. In addition, the main forms of student evaluation include knowledge maps, knowledge lists and other forms, they can dynamically keep records of individual students' knowledge acquisition situations, and no longer be based on a sole kind of data such as the test scores. However, focusing on procedural evaluation does not mean abandoning summative evaluation. In the context of AI, the evaluation of art teaching should be personalized, procedural, summative, two-way or even multi-directional, so that students could have a comprehensive understanding of themselves and improve their learning methods accordingly.

4 Strategies for the Implementation of AI in Modern art Teaching

With the rapid development of AI, its role in college art teaching is becoming more and more important. As AI is being applied in art teaching, the role of art teachers should be changed accordingly as well, art teachers could make full use of AI to track students' learning process and effect and conduct intelligent analysis, constantly adjust the curriculum design and teaching content, achieving personalized and customized teaching, and such personalization will present more objective and quantitative characteristics. AI system can also effectively filter information, dynamically generate content and strategies suitable for personalized teaching according to the basic data and information of teaching activities, and provide teachers with suggestions concerning the key points, methods, test points, and question types of art teaching. AI will reach a balance between scale and personalization, bringing a solution that is easy for students to learn and easy for art teachers to teach, and art teachers could co-exist with AI. In the future, the art knowledge transfer function of art teachers will be gradually replaced by AI, and art teachers should pay more attention to the cultivation of students' core literacy. Combining with the current development status of AI, this paper proposes to implement AI in modern art teaching from the following aspects:

4.1 Expand the adaptability of AI-based art teaching

Judging from the current application status of AI in art teaching, there're still problems in art teaching such as insufficient personalization. If the art teaching content is not targeted or the teaching method is not flexible enough, they can hardly meet the personalized learning requirements of art major students, which will further hinder the development of their innovative ability. With the help of AI, we can offer various procedural teaching evaluations, enrich the evaluation methods, and make the evaluation process more scientific and the evaluation results more accurate. The collaboration of the AI assistant and the intelligent evaluation system can provide art students with comprehensive learning diagnosis with timely and accurate learning intervention, so as to truly achieve the unity of scale and personalization in art teaching. We should increase the application of data-based AI learning analysis technology in art teaching.

The AI learning analysis technology interprets and analyzes the massive data of students generated in the learning process to evaluate their academic progress and predict their future learning performance, thereby discovering the potential learning problems. That is, at first, it records and analyzes the learning behavior data of students generated in the learning process, each student would have a unique “portrait” so that the art teachers and the students themselves could master their learning characteristics and laws, and thereby carrying out personalized learning; second, AI could dynamically feedback the learning performance of art students during the learning process to the teachers, and display the students’ learning process in the form of visual data, so that teachers could adjust the teaching content and methods according to the results in real time. The use of AI enables teachers to teach according to students’ aptitudes despite there’re many students in the class, it provides different students with targeted teaching modes, and could solve the problems encountered by students in the basic learning process of art education.

4.2 Improve the intelligent teaching mode of art teaching

The deep-level application of AI in the field of art education management will make management services smarter, and the informatization and intelligentization of art education management can effectively support the separation of the supervision, execution and evaluation of art education, improve the public service level of art education, and promote the governance ability of art education and the modernization of the governance system. In terms of art education big data, AI could collect the data of art education, model the teaching process, conduct intelligent and systematic analysis, and achieve scientific decision-making of art education and accurate resource allocation. Compared with the application of AI in other fields, the amount of data generated in the field of art education is relatively small and not comprehensive enough, which would limit the further application of AI in the education field. In China, the application of AI in education started late, it hasn’t established a sound and standard data perception system or data reserve base yet. In order to promote the further application of AI in art education, in future development process, it is necessary to change the pattern of single education data, and further expand the scale of art education data. The knowledge graph technology based on data samples will play an important role in further increasing the data scale, with this technology, we can discover the correlations between different art student groups, which is conducive to improving the teaching content for students and upgrading the teaching quality of art education.

4.3 Enhance the artistic experience and atmosphere of AI-based art teaching

AI has injected new vitality into the realization of personalized learning and the cultivation of innovative thinking, the introduction of AI will completely change the classroom form of art teaching; the teaching environment and campus environment of art classrooms will be changed profoundly. The online-offline classes are integrated, the in-class and after-class education are connected, and the highly digitalized and intelligent teaching environment will be fully popularized, which can greatly improve

the personalized service level of the art teaching environment. In the new era, there're important problems in art education such as how to provide supports for the students' learning, the students' personalized development, and the cultivation of students' thinking; AI has changed the art students' learning methods, it can generate personalized and customized learning plans according to the specific learning requirements of students, and provide immersive learning experience and highly intelligent learning process tracking services. VR can play an important role in solving these problems. It is a computer simulation system that can create virtual worlds, after users wear VR glass, data glove and other special sensing devices, they can immerse in the created virtual environments; the VR system can provide users with visual, auditory and tactile information and make them have multiple perceptions, and simulated and interactive experiences. This is very meaningful for various disciplines, especially for art teaching. On the one hand, this technology can build an intelligent art learning environment that makes learners feel more engaged; one the other hand, it can greatly improve the learning enthusiasm of art students and the classroom teaching effect of art teachers.

5 Application Performance Analysis of AI in Modern art Teaching

To measure the application effect of AI in modern art teaching, the application performance should be analyzed. Under the guidance of scientific, objective and targeted principles, this study consulted experts and selected several indicators to analyze the application performance of AI in art teaching, including art teaching mode, art teaching method, art teaching content, teaching atmosphere in art classes, art teaching means, art teaching effect, and art teaching environment, etc. Through the expert scoring method, a weight judgment matrix of performance indicators A was constructed as follows:

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

Using AHP method [16-20], the weight sequence W corresponding to the above-mentioned performance indicators was obtained as:

$$W = \{0.144, 0.088, 0.077, 0.103, 0.196, 0.268, 0.124\} \quad (2)$$

For a certain performance analysis object P, its initial value with respect to performance indicator j was $v_j(P)$, if this indicator was a positive indicator, then after normalization, the value was $u_j(P)$:

$$u_j(P) = \frac{v_j(P) - v_j^{\min}(O)}{v_j^{\max}(O) - v_j^{\min}(O)} \quad (3)$$

where: $v_j^{\max(O)}$ represents the maximum value of indicator j of object P, $v_j^{\min(O)}$ represents the minimum value of indicator j of object P.

$$u_j(P) = \frac{v_j^{\max}(O) - v_j(P)}{v_j^{\max}(O) - v_j^{\min}(O)} \quad (4)$$

After consulting experts, the application performance of AI in modern art teaching had been divided into M degrees, the gray clustering function of performance indicator j on the k-th application performance degree [21-25] was $\phi_j^k(u) = \phi_j^k[u_j^k(a), u_j^k(b), u_j^k(c), u_j^k(d)]$, wherein, $u_j^k(a)$, $u_j^k(b)$, $u_j^k(c)$, and $u_j^k(d)$ were the turning points of $\phi_j^k(u)$, that is:

$$\phi_j^k(u) = \begin{cases} 0 & u \notin [u_j^k(a), u_j^k(d)] \\ 1 & u \in [u_j^k(b), u_j^k(c)] \\ \frac{u - u_j^k(a)}{u_j^k(b) - u_j^k(a)} & u \in [u_j^k(a), u_j^k(b)] \\ \frac{u_j^k(d) - u}{u_j^k(d) - u_j^k(c)} & u \in [u_j^k(c), u_j^k(d)] \end{cases} \quad (5)$$

In particular, if $u_j^k(a) = u_j^k(b)$, then $\phi_j^k(u)$ is the gray clustering function of the lower limit measure, that is:

$$\phi_j^k(u) = \begin{cases} 1 & u \in [0, u_j^k(c)] \\ \frac{u_j^k(d) - u}{u_j^k(d) - u_j^k(c)} & u \in [u_j^k(c), u_j^k(d)] \\ 0 & u \in [u_j^k(d), 1] \end{cases} \quad (6)$$

If $u_j^k(b) = u_j^k(c)$, then $\phi_j^k(u)$ is the gray clustering function of the moderate measure, that is:

$$\phi_j^k(u) = \begin{cases} 0 & u \in [0, u_j^s(a)] \\ \frac{u - u_j^s(a)}{u_j^s(b) - u_j^s(a)} & u \in [u_j^s(a), u_j^s(b)] \\ \frac{u_j^s(c) - u}{u_j^s(c) - u_j^s(b)} & u \in [u_j^s(b), u_j^s(c)] \\ 0 & u \in [u_j^s(c), 1] \end{cases} \quad (7)$$

If $u_j^k(c) = u_j^k(d)$, then $\phi_j^k(u)$ is the gray clustering function of the upper limit measure, that is:

$$\phi_j^k(u) = \begin{cases} 1 & u \in [u_j^k(b), 1] \\ \frac{u - u_j^k(a)}{u_j^k(b) - u_j^k(a)} & u \in [u_j^k(a), u_j^k(b)] \\ 0 & u \in [0, u_j^k(a)] \end{cases} \quad (8)$$

Then for object P, the weighted gray correlation degree $\xi^k(u)$ of all indicators with respect to the k-th performance degree was:

$$\xi^k(u) = \sum_{j=1}^n (w_j * \phi_j^k(u)) \quad (9)$$

If it satisfies:

$$\xi^i(u) = \max_{1 \leq k \leq M} (\xi^k(u)), \quad 1 \leq i, k \leq M \quad (10)$$

Then, it means that the performance degree of object P was the closest to the i-th performance degree, that is, the gray performance degree of object P was i.

6 Conclusion

The paper analyzed the application of AI in college art teaching, discussed its shortcomings and the promotive role in college art teaching, and proposed several strategies for using AI to provide supports to art teaching. Considering that the promotion effect of AI on art teaching in colleges and universities is affected by many factors, in order to effectively measure the application effect of AI in art teaching, this paper constructed the corresponding performance model, and combining theoretical analysis and calculation model to analyze the application strategies of applying AI in

modern art teaching, which has good values in theoretical innovation and engineering practice.

7 Acknowledgment

1. Research on the Contemporary Value of Red Classical Oil Painting in the Context of New Age (Ranked 4th), Humanities and Social Sciences Research Project of Ministry of Education's;
2. Intangible Cultural Heritage-Research on the Popularization of Face Painting Art in Society, Art Science Planning Project of Heilongjiang Province (No. 2016D078);
3. Study on the Inheritance and Innovation of Han Dynasty Stone Portrait Art in Contemporary Oil Painting Creation (ZD201906173), Key Project of Shandong Science and Technology in 2019;
4. Campus Cultural and Creative Products Based on Heilongjiang Traditional Folk Art in 2015, Provincial Department of Culture 2015-2017.

8 References

- [1] Shukla, A.K., Janmajaya, M., Abraham, A., Muhuri, P.K. (2019). Engineering applications of artificial intelligence: A bibliometric analysis of 30 years (1988–2018). *Engineering Applications of Artificial Intelligence*, 85: 517-532. <https://doi.org/10.1016/j.engappai.2019.06.010>.
- [2] Sukhbaatar, O., Usagawa, T., Choimaa, L. (2019). An artificial neural network based early prediction of failure-prone students in blended learning course, *International Journal of Emerging Technologies in Learning*, 14(19): 77-92. <https://doi.org/10.3991/ijet.v14i19.10366>
- [3] Ma, W.Y. (2019). A neighborhood structure-preserving bi-objective optimization method based on class center and discriminant analysis and its application in facial recognition. *Revue d'Intelligence Artificielle*, 33(3): 219-225. <https://doi.org/10.18280/ria.330308>
- [4] Zhou, M.Y. (2020). Opportunities, Challenges and Countermeasures: Teaching Reform in the Age of Artificial Intelligence. *Modern Education Management*, 2020(3): 110-116. <https://doi.org/10.16697/j.1674-5485.2020.03.017>.
- [5] Deb, K., Banerjee, S., Chatterjee, R.P., Das, A., Bag, R. (2019). Educational website ranking using fuzzy logic and k-means clustering based hybrid method. *Ingénierie des Systèmes d'Information*, 24(5): 497-506. <https://doi.org/10.18280/isi.240506>
- [6] Tang, Y., He, S.Y. (2019). Research on the education mode of "artificial intelligence + higher vocational art major" entrepreneurship and employment. *China Journal of Commerce*, 2019(14): 223-225. <https://doi.org/10.19699/j.cnki.issn2096-0298.2019.14.223>.
- [7] Jin, Q.H. (2018). Research on the possibility and development trend of artificial intelligence technology applied to music education. *Journal of Hubei Correspondence University*, 31(11): 142-143. <https://doi.org/10.3969/j.issn.1671-5918.2018.11.063>.
- [8] Ahmad, M.F., Ghapar, W.R.G.W.A. (2019). The era of artificial intelligence in Malaysian higher education: Impact and Challenges in Tangible Mixed-Reality Learning System

- toward Self Exploration Education (SEE). *Procedia Computer Science*, 163: 2-10. <https://doi.org/10.1016/j.procs.2019.12.079>.
- [9] Wan, G.M. (2020). Research on the training mode of Applied Talents in broadcasting and hosting art major in the era of artificial intelligence. *News World*, 2020(2): 84-88. <https://doi.org/10.19497/j.cnki.1005-5932.2020.02.025>.
- [10] Li, W. (2019). Application and research of music artificial intelligence in music education. *Journal of Xinghai Conservatory of Music*, 2019(3): 145-150. <https://doi.org/10.3969/j.issn.1008-7389.2019.03.013>.
- [11] Chassignol, M., Khoroshavin, A., Klimova, A., Bilyatdinova, A. (2018). Artificial Intelligence trends in education: a narrative overview. *Procedia Computer Science*, 136: 16-24. <http://doi.org/10.1016/j.procs.2018.08.233>.
- [12] Casazza, M., Gioppo, L. (2020). A playwriting technique to engage on a shared reflective enquiry about the social sustainability of robotization and artificial intelligence. *Journal of Cleaner Production*, 248: 1-10. <https://doi.org/10.1016/j.jclepro.2019.119201>.
- [13] Goralski, M.A., Tan, T.K. (2020). Artificial intelligence and sustainable development. *The International Journal of Management Education*, 18(1): 1-9. <https://doi.org/10.1016/j.ijme.2019.100330>.
- [14] Bajaj, R., Sharma, V. (2018). Smart Education with artificial intelligence based determination of learning styles. *Procedia Computer Science*, 132: 834-842. <https://doi.org/10.1016/j.procs.2018.05.095>.
- [15] Wenming, Z., Erwen, Z. (2019). Application of neural network machine translation in college translation teaching. *International Journal of Emerging Technologies in Learning*, 14(19): 16-25. <https://doi.org/10.3991/ijet.v14i19.10690>
- [16] Moussaoui, F., Cherrared, M., Kacimi, M.A., Belarbi, R. (2018). A genetic algorithm to optimize consistency ratio in AHP method for energy performance assessment of residential buildings—Application of top-down and bottom-up approaches in Algerian case study. *Sustainable Cities and Society*, 42: 622-636. <http://doi.org/10.1016/j.scs.2017.08.008>.
- [17] Haque, H.M., Dhakal, S., Mostafa, S.M. (2020). An assessment of opportunities and challenges for cross-border electricity trade for Bangladesh using SWOT-AHP approach. *Energy Policy*, 137: 1-12. <https://doi.org/10.1016/j.enpol.2019.111118>.
- [18] Gurcan, O.F., Yazici, I., Beyca, O.F., Arslan, C., Eldemir, F. (2016). Third Party Logistics (3PL) Provider Selection with AHP Application. *Procedia - Social and Behavioral Sciences*, 235: 226-234. <https://doi.org/10.1016/j.sbspro.2016.11.018>.
- [19] Kamdar, I., Ali, S., Bennui, A., Techato, K., Jutidamrongphan, W. (2019). Municipal solid waste landfill siting using an integrated GIS-AHP approach: A case study from Songkhla, Thailand. *Resources, Conservation and Recycling*, 149: 220-235. <https://doi.org/10.1016/j.resconrec.2019.05.027>
- [20] Giner-Santonja, G., Calvo, V.V., Lepe, G.R. (2019). Application of AHP and corrective factors for the determination of best available techniques and emission limit values at installation level: A case study in four cement installations. *Science of The Total Environment*, 660: 834-840. <https://doi.org/10.1016/j.scitotenv.2018.12.473>.
- [21] Karakoc, O., Es, H.A., Firat, S.U. (2019). Evaluation of the development level of provinces by grey cluster analysis. *Procedia Computer Science*, 158: 135-144. <https://doi.org/10.1016/j.procs.2019.09.036>.
- [22] Rajesh, R. (2018). Measuring the barriers to resilience in manufacturing supply chains using Grey Clustering and VIKOR approaches. *Measurement*, 126: 259-273. <https://doi.org/10.1016/j.measurement.2018.05.043>.

- [23] Delgado, A., Romero, I. (2016) Environmental conflict analysis using an integrated grey clustering and entropy-weight method: A case study of a mining project in Peru. *Environmental Modelling & Software*, 77(77): 108-121. <http://doi.org/10.1016/j.envsoft.2015.12.011>.
- [24] Teminoboes, R., Romerolopez, R., Ibarrazavaleta, S.P., Romero, I. (2020). Using grey clustering to evaluate nitrogen pollution in estuaries with limited data. *Science of The Total Environment*, 722: 1-12. <https://doi.org/10.1016/j.scitotenv.2020.137964>.
- [25] Fahad, M., Aadil, F., Rehman, Z., Khan, S., Shah, P.A., Muhammad, K., Mehmood, I. (2018). Grey wolf optimization based clustering algorithm for vehicular ad-hoc networks. *Computers & Electrical Engineering*, 70: 853-870. <https://doi.org/10.1016/j.compeleceng.2018.01.002>.

9 Author

Fanwen Kong, a graduate from Shanghai Theater Academy. He works on painting practice and teaching in the Art College of Shandong University (Weihai). He is specialized in oil painting, lacquer painting, art education and teaching management, and has published several core papers.

Article submitted 2020-05-01. Resubmitted 2020-06-10. Final acceptance 2020-06-12. Final version published as submitted by the authors.