Journal of Artificial Intelligence Practice (2023)
Clausius Scientific Press, Canada

DOI: 10.23977/jaip.2023.060804
ISSN 2371-8412 Vol. 6 Num. 8

Utilization of Artificial Intelligence Technology in Higher Education Management: Teaching Theory and Practical Skills of Landscape Architecture Construction Technology

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Keywords: Artificial Intelligence Technology, University Education Management, Garden Landscape Construction, Teaching Theory, Practical Skill

Abstract: In traditional university education management, landscape construction technology helps students comprehensively master landscape construction technology by teaching theoretical knowledge such as the basic principles of landscape construction and setting up practical bases for landscape construction. However, this approach has some limitations, such as delayed information transmission, which limits the flexibility and effectiveness of learning. Therefore, artificial intelligence technology can be applied to the teaching theory and practice of landscape construction technology in university education management. The word bag model and SVM (Support Vector Machine) algorithm were used as a case analysis tool for landscape construction technology to analyze construction problems and solutions in real cases, and then virtual reality (VR) and augmented reality (AR) technologies were used to enable students to practice landscape construction in a virtual environment. Finally, a Convolutional Neural Network (CNN) model was used to provide specific learning resources and operational recommendations. This article applied artificial intelligence technology to the theory and practice of landscape construction technology in university education management. The average score of students in the test has increased by 8 points, and over 90% of students can independently complete the experiment. With the help of artificial intelligence technology, university education management can break the limitations of time and space, improve the flexibility and convenience of students' learning, and provide more timely feedback for education managers.

1. Introduction

In contemporary higher education management, digital transformation is necessary, and adopting new teaching methods with the help of digital technology is not only a requirement of students, but also a requirement of the entire society [1]. The use of artificial intelligence technology to improve the teaching theory and practical skills of landscape construction technology in traditional universities can achieve educational resource sharing and cooperation, and improve the quality and level of teaching in schools.

This article applies artificial intelligence technology to the theory and practice of landscape construction technology in university teaching. Firstly, teachers need to integrate artificial intelligence technology with landscape construction technology teaching, and design artificial intelligence technology application solutions that meet the learning characteristics and needs of students. They further integrate artificial intelligence technology and teaching resources to summarize theoretical knowledge such as problems and corresponding solutions in landscape construction. Teachers also need to organize students to practice, using virtual reality (VR) and augmented reality (AR) technology to simulate real garden landscape construction practice scenarios, achieving garden landscape construction practice operations in a virtual environment, and providing a safer and more convenient practical environment. They then use Convolutional Neural Network (CNN) models to provide customized learning paths and guidance based on students' learning characteristics and ability levels. At the same time, teachers provide guidance based on students' learning data and performance.

2. Related Work

The teaching theory and practical skills in higher education management involve teaching design and evaluation, classroom interaction and communication, technical support, and teaching training. Jennifer Catherine Evans and others used the online teacher professional development course offered by blended learning mode as an example to demonstrate that blended learning mode is very effective in promoting the use of university learning management systems, providing professional development in blended learning mode and providing teachers with a real student perspective [2]. Elena R. Vershitskaya and others conducted a survey in the form of a questionnaire and found that in implementing modern management prospects for e-learning, attention should be paid to the possibility of interaction between students and teachers, as well as the expansion of educational geography, in order to achieve the success of e-learning plans and the popularization of e-learning projects [3]. Abdulaziz Aldiab and others utilized computer technology to construct a learning management system in academic institutions and made it a part of the education management system to improve the teaching and learning experience of higher education systems [4]. The traditional education management method in universities is usually a batch teaching model, which cannot meet the personalized learning needs of different students and also limits their participation and innovation ability.

This article applied artificial intelligence technology to the teaching theory and practical skills of landscape construction technology in university education management. Artificial intelligence technology can process and analyze a large amount of data, improve work efficiency and productivity, and provide more personalized services and experiences. It has been widely applied in various fields. Yoav Mintz and others incorporated artificial intelligence technology into the medical field, improving patient care by accelerating processes and achieving higher accuracy, opening the way for providing better overall healthcare [5]. Shuai Zhao and others reviewed the application of artificial intelligence in power electronic systems and discussed the applications of four types of artificial intelligence: expert systems, fuzzy logic, meta heuristic methods, and machine learning, in order to determine the common understanding, practical implementation challenges, and research opportunities of artificial intelligence in power electronic applications [6]. Rusul Abduljabbar and others utilized artificial intelligence technology to overcome the growing demand for travel, carbon dioxide emissions, safety issues, and environmental degradation in the transportation sector, addressing these issues in a more efficient and effective manner, making passenger travel time more reliable, and improving the economy and productivity of their important assets [7]. This article utilized artificial intelligence technology to support online and online teaching, achieving the expansion of learning time and space and resource sharing. It also utilized virtual reality technology to provide an interactive computer simulation experimental system for landscape construction, better promoting the improvement of students' overall quality.

3. Methods

3.1 Application of Theoretical Knowledge

3.1.1 Data Collection and Preprocessing

The relevant data of garden landscape construction is collected, including images, videos, records, etc. The data is preprocessed and interfering data is removed to ensure data quality. If there is a large amount of irrelevant data, subsequent model learning becomes very difficult [8]. Table 1 shows some data from the construction of garden landscapes.

Table 1: Record of landscape construction

Construction content	Type of material	Construction problem	Solution
Earthwork	Soil, Sand, Garbage soil	Uneven soil layer	Baked hard soil
Installation path and steps	Marble, Wood, Concrete, Brick	Dimensional deviation	Use professional tools and techniques to ensure construction accuracy
Flower planting	Flowers and plants, Ground cover, Soil, Fertilizer	Plant diseases and pests	Spray
Streetlight	Light pole, Luminaire, Power supply, Concrete base	Cable fault	Check cables and power equipment regularly and repair or replace damaged parts in a timely manner
Water features and water treatment	Water pump, Water tank, Water quality detector, Water level detector	Water leakage	Repair leaks or strengthen waterproofing of pools and pipes

3.1.2 Text Feature Extraction

For the descriptive information in the records, the word bag model is used for feature extraction to extract valuable information such as keywords and themes from the records. The word bag model ignores grammar and words, treating the text as a collection of several words [9]. The order of appearance first splits the text into words, counts all the words after splitting, and establishes a vocabulary, with each word having a unique index in the vocabulary. Based on a vocabulary, a fixed length vector is created for each text, with each element of the vector representing the frequency of the corresponding vocabulary. Finally, these feature vectors are combined into a feature matrix for subsequent input to the Support Vector Machine (SVM) algorithm.

3.1.3 SVM Model Training and Prediction

The purpose of SVM is to represent a multidimensional dataset in a space separated by hyperplanes of data elements of different categories, and separating hyperplanes is also known as the optimal hyperplane [10]. The converted vocabulary information is divided into an 80% training set and a 20% test set, and the model is trained using the training set data to enable the model to learn classification rules in the training set. A linearly separable training dataset with the following form: $(X_1, y_1), (X_2, y_2), \ldots, (X_n, y_n)$, where X_i $(1 \le i \le n)$ is a column vector containing d elements, that is, $X_i \in R^d$. y_i is a scalar, $y \in +1, -1$. When $y_i = +1$, it represents X_i positive categories of data, and when $y_i = -1$, it represents X_i negative categories of data.

A hyperplane is determined by the normal vector W and intercept b, and its equation is $X_i^T + b = 0$. In the linearly separable case, the sample points in the training dataset and the data points closest to the separated hyperplane are called support vectors, which satisfy:

$$y_i (X_i^T W + b) = 1 \tag{1}$$

By ultimately finding the optimal hyperplane through support vectors, it is possible to correctly identify and understand the problems and solutions in landscape construction.

After the SVM model finds the optimal hyperplane, the feature vectors in the test dataset are substituted into the optimal hyperplane. According to the position of the hyperplane, the category to which the feature vector belongs is determined, that is, the garden landscape construction data in the test set is analyzed; problems are identified, and solutions are evaluated. The performance of the SVM model is evaluated through the accuracy of the test.

When encountering unseen garden landscape construction problems during the teaching process, the trained SVM model can be used for analysis, identification of problems and solutions, and intelligent suggestions and guidance can be provided to enrich and comprehensively learn theoretical knowledge.

3.2 Application of Practical Skills

3.2.1 Construction Scenario Simulation

The General Adversarial Networks (GAN) in artificial intelligence technology is used to generate realistic garden landscape construction scene models, and GAN is used to achieve three-dimensional patterns of images following the activation of random generators and discriminators. The generator helps to understand image types, and the discriminator trains two-dimensional image markers [11]. The models include buildings, plants, roads, water bodies, terrain, etc., and are generated and arranged in 3D scenes. The process is shown in Figure 1.

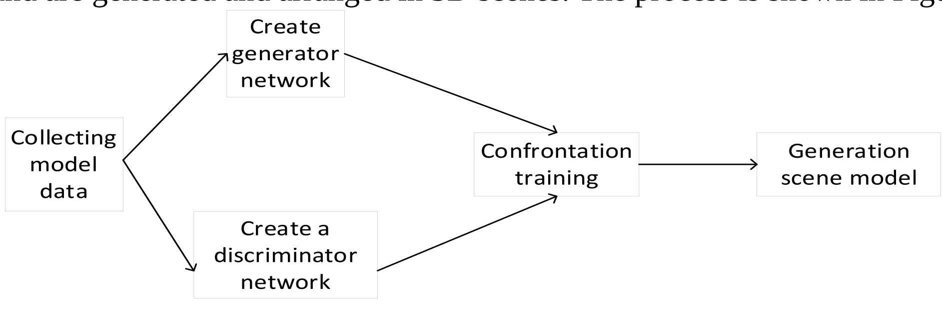

Figure 1: Process of adversarial network generation scenario model

3.2.2 Physical Simulation

Introducing a physics engine to simulate objects in virtual construction scenes can simulate and analyze various environmental factors of garden landscapes, such as simulating the effects of light and shadow, wind direction and speed on plants.

3.2.3 Operation Interaction

VR and AR technologies enable students to conduct practical operations in virtual environments. Firstly, a headworn display and handle is used to provide students with an immersive virtual environment, simulating garden construction tasks in virtual scenes, such as building paths, installing water pools, etc. Students use devices such as handles to perform virtual operations, such as digging and transporting materials, in order to learn and practice practical garden construction skills. Then, AR technology is used to overlay virtual information into the real world that students see, such as using AR glasses to observe garden landscapes in a real environment, and overlaying virtual guidance and instructions related to construction tasks on top of them. Students view virtual guidance through AR equipment, and then perform corresponding operations and exercises in the real environment.

3.3 Personalized Guidance

VR technology is used to monitor students' movements and perform real-time pose correction. Students can improve their operational skills and decision-making based on feedback. Personalized guidance and suggestions are provided based on students' operational data and machine learning algorithms. Based on students' specific needs and ability levels, the system can provide specific learning resources and operational suggestions for their weaknesses, helping them improve their practical skills in landscape construction [12].

This article uses CNN to customize guidance and suggestions based on students' individual characteristics and learning progress, in order to provide more accurate and effective assistance. Students' operational data in virtual scenes of landscape construction is collected, including their actions, decisions, and reactions. The student's operational data is preprocessed and cleaned. Based on the student's operational dataset, a CNN model suitable for personalized guidance and suggestions is established. During training, non operational data such as students' body language, speech, and physiological indicators is added to improve the applicability and accuracy of the model. The specific process is shown in Figure 2.

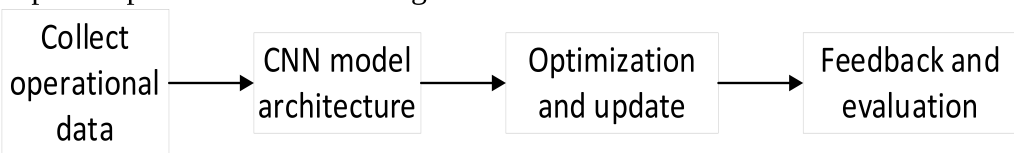

Figure 2: CNN personalized guidance process

The process of personalized guidance and advice not only relies on CNN models, but also requires the integration of domain expertise. Therefore, sufficient research and validation should be conducted before implementation.

4. Experimental Results

4.1 SVM Model Effects

A total of 10537 records of garden landscape construction are collected and divided into ten datasets for training and prediction. The prediction accuracy effect is shown in Figure 3.

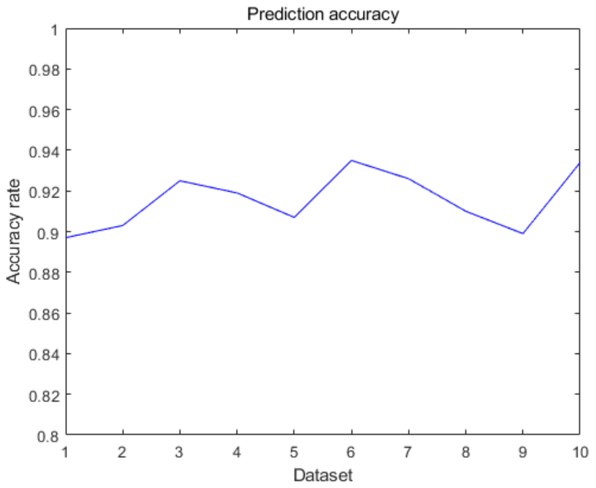

Figure 3: SVM model prediction accuracy

As shown in Figure 3, the SVM model has a high prediction accuracy, indicating a good prediction effect.

4.2 CNN Model Effect

By conducting experiments on 23730 students majoring in landscape architecture from 5 universities, 102456 pieces of practical operation data are collected. A CNN model is used to provide 5 suggestions and guidance for each student. Among them, 19067 believe that all 5 pieces are valid; 1663 believe that 4 pieces are valid; 1056 believe that 3 pieces are valid; 870 believe that 2 pieces are valid; 693 believe that 1 piece is valid; 381 believe that all are invalid. The proportion is shown in Figure 4.

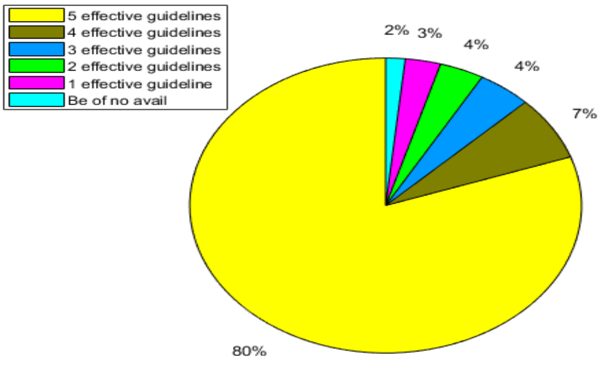

Figure 4: Guiding effect of CNN model

As shown in Figure 4, the vast majority of students believe that the CNN model provides effective guidance and suggestions.

4.3 Score Comparison Effect

Two theoretical knowledge tests on landscape architecture construction are conducted on students from five universities, and it is found that after using artificial intelligence technology to master theoretical knowledge, the average score of students increases by 8 points. The comparison of scores is shown in Figure 5.

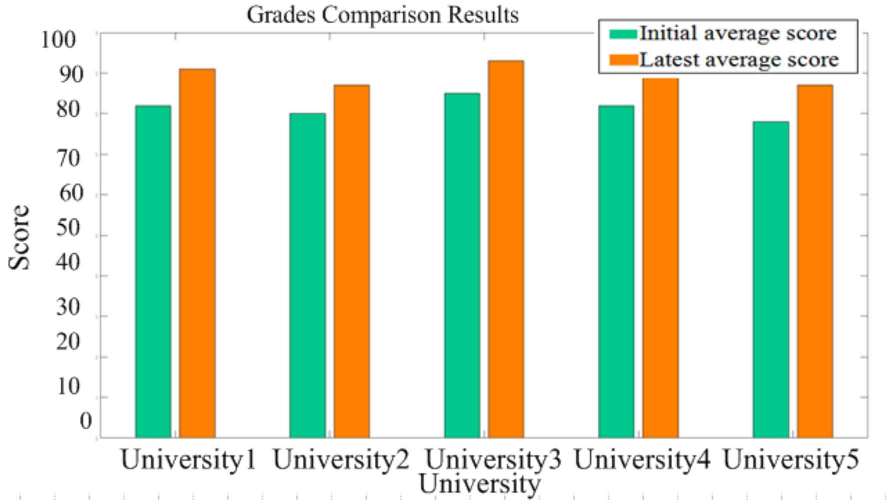

Figure 5: Score comparison results

The green bar chart represents the initial average test score, while the orange bar chart represents the latest average test score. It can be observed that the average score has significantly improved, indicating good learning outcomes.

4.4 Practice Completion Effect

The number of students who are able to independently complete garden landscape construction practice projects is gradually increasing, exceeding 90%, compared to the absence of artificial intelligence technology simulation practice, with a significant increase in the number of students. The completion effect is shown in Figure 6.

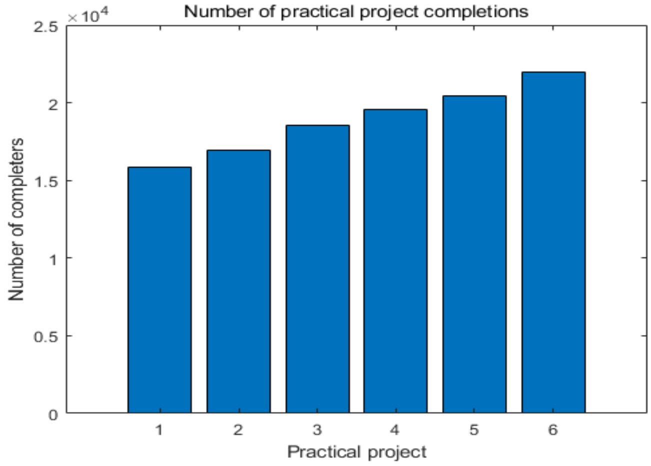

Figure 6: Number of people completing practical projects

The first practical project in Figure 6 is not simulated using artificial intelligence technology, with a total of 15874 people completing it. As artificial intelligence technology gradually practices, over 90% of students in the sixth practical project are able to complete it independently, indicating that good results have been achieved.

5. Conclusions

The application of artificial intelligence technology in the teaching theory and practical skills of landscape construction technology in university education management has achieved certain results. Artificial intelligence technology can be used to analyze key problems and solutions of real landscape construction, and provide intelligent suggestions and guidance. It can also enable students to carry out practical operations of landscape construction in virtual environments. However, when providing personalized guidance to students, full consideration should be given to privacy protection and data security, and the use of artificial intelligence technology can be further improved. The use of artificial intelligence technology as a learning method can play a greater role in landscape construction, providing more practical suggestions and a more convenient practical environment, providing better educational experiences and learning outcomes for educational managers and students.

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