AI-Empowered Fashion Design Teaching and Creation Mode from the Perspective of Intangible Cultural Heritage

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Abstract: Under the background of globalization and digitalization, the inheritance of Intangible cultural heritage (ICH) and the innovative development of fashion design have attracted much attention. At present, with the rapid development of artificial intelligence (AI) technology, its application in fashion design teaching is gradually changing the traditional teaching mode and building a brand-new theoretical framework. This paper focuses on the teaching and creative mode of AI-empowered fashion design from the perspective of ICH. Through literature research and theoretical analysis, this paper analyzes the technical characteristics of ICH, fashion design and AI, and constructs the relevant theoretical framework and model. It is found that AI can reshape the teaching goal of fashion design, enrich the teaching content and innovate the teaching methods. In the creative mode, it can realize creative generation based on AI, assist process optimization and help personalized customization. This shows that AI has brought changes to the teaching and creation of fashion design, provided an effective way for the creative transformation and innovative development of ICH in the field of fashion design, and is expected to promote the transformation and upgrading of the fashion design industry and cultivate design talents to meet the needs of the times.

1. Introduction

In today's era of rapid development of globalization and digitalization, the inheritance and innovation of traditional culture has become the focus of attention from all walks of life. As a treasure of human civilization, ICH bears rich historical memory and national spirit [1]. Among them, the integration of ICH and fashion design not only injects profound cultural heritage into fashion design, but also is an important way to realize ICH live transmission [2].

With the rapid development of AI technology, it shows great application potential in various fields, and the field of fashion design is no exception [3]. With its powerful data processing, analysis and generation capabilities, AI is quietly changing the teaching and creative mode of fashion design. However, at present, in the view of ICH, the systematic research on how AI can empower fashion design teaching and creation is still insufficient [4]. From the perspective of fashion design teaching, the traditional teaching mode has some limitations in knowledge dissemination and practical operation guidance, and it is difficult to meet the needs of innovative design talents training in the new era [5]. Integrating AI technology into teaching is expected to break these limitations. Through intelligent teaching methods, students' cognition and application ability of ICH elements can be improved, and their innovative thinking and practical ability can be cultivated. In fashion design, AI technology can provide new design ideas and methods [6]. It can quickly analyze massive ICH materials, generate unique design inspiration for designers, help optimize the design process, and realize personalized customization creation. This innovative creative mode is helpful to promote the transformation and upgrading of fashion design industry on the basis of inheriting ICH.

Therefore, it is of great significance to explore the teaching and creative mode of AI-empowered fashion design from the perspective of ICH. The purpose of this study is to fill the theoretical gaps

in related fields and provide theoretical guidance and innovative paths for the teaching reform and creative practice of fashion design, so as to realize the creative transformation and innovative development of ICH in the field of fashion design under the background of the integration of technology and culture.

2. ICH and fashion design and AI technology

ICH is a variety of traditional cultural expressions handed down from generation to generation by people of all ethnic groups and regarded as part of their cultural heritage, as well as physical objects and places related to traditional cultural expressions [7]. It covers folk literature, traditional music, traditional dance, traditional skills and many other categories, among which ICH, a traditional skill category, is closely related to fashion design. Embroidery techniques such as Su embroidery and Shu embroidery add unique artistic charm to clothing through delicate stitches and rich colors; Tujia Brocade Xilankapu, with its unique patterns and weaving technology, shows rich ethnic customs [8]. The integration of these ICH elements into clothing design not only enhances the cultural value of clothing, but also promotes the spread and inheritance of ICH.

Fashion design is a comprehensive art, which integrates aesthetics, culture, technology and other knowledge [9]. Traditional clothing design pays attention to manual skills and personal experience, and designers express their design ideas through the selection and collocation of materials, colors and styles. However, with the development of the times, traditional design methods are facing innovative challenges and need to introduce new elements and technologies.

AI technology is a branch of computer science, which aims to make machines have some characteristics of human intelligence, such as learning, reasoning and judgment. In the field of design, AI technology is mainly used in image recognition and generative design. Through learning a large number of design data, AI can analyze design trends, extract design elements, and generate new design schemes according to set conditions [10]. For example, the creative sketch of clothing style can be generated by using GAN. With the help of machine learning algorithm, clothing color matching can be optimized. The introduction of AI technology brings new possibilities for fashion design, especially has unique advantages in dealing with complex data and innovative design, and provides a powerful tool for the deep integration of ICH and fashion design.

3. AI empowers the theoretical framework of fashion design teaching

With the rapid development of AI technology, its application in fashion design teaching is gradually changing the traditional teaching mode and building a brand-new theoretical framework. Starting from three key dimensions: teaching objectives, teaching contents and teaching methods, this framework provides a strong support for training fashion design talents to meet the needs of the times.

3.1. Reshaping teaching objectives based on AI

Under the background of AI empowerment, the goal of fashion design teaching should be changed from simple skill teaching to cultivating comprehensive talents with innovative thinking and interdisciplinary ability. The traditional teaching goal focuses on making students master basic design skills and technological skills. In the AI era, students need to have the ability to understand and use AI tools to explore ICH elements, and then innovate design. Students should not only learn to draw clothing sketches by hand, but also use AI image generation technology to quickly obtain creative design inspiration based on ICH elements, and screen and optimize it. This change in teaching objectives aims to enable students to flexibly use AI technology in future design work, deeply integrate ICH with modern design concepts, and create clothing works with both cultural connotations and market demands.

3.2. Enriching teaching content with AI

AI image recognition and data analysis technology are introduced to help students dig deeply

into patterns, colors, materials and other elements in ICH. By training AI model, we can sort out a large number of ICH embroidery, printing and dyeing patterns, and analyze their composition rules and cultural implications. With the help of this technology, students can understand ICH elements more comprehensively and systematically, and provide rich materials for design and creation. Use generative AI technology, such as GAN, to generate the first draft of fashion design based on ICH. These design contents generated by AI are unique in style and combine ICH with modern aesthetics, providing students with brand-new design ideas and reference directions. On this basis, students can modify and improve their own design concepts to cultivate innovative design ability.

3.3. Relying on AI to innovate teaching methods

With the help of AI intelligent evaluation system, according to students' learning progress, knowledge mastery and design style preference, a personalized learning path is developed for each student. For students who are good at color matching but weak in pattern design, the system can push more learning resources related to ICH pattern design and arrange targeted practical tasks to help students improve their abilities.

Combining AI with virtual reality (VR) and augmented reality (AR) technologies, a virtual practice teaching environment is created. Students can perform practical operations such as garment cutting and sewing in the virtual environment, and get real-time guidance and feedback from the AI system. This kind of virtual practice teaching can not only reduce the practice cost, but also enable students to practice repeatedly in a safe and convenient environment and improve their practical skills. At the same time, students can also intuitively feel the wearing effect of fashion design with ICH elements in different scenes through virtual display, and enhance their overall grasp of design works.

Through the remodeling of teaching objectives based on AI, the enrichment of teaching contents and the innovation of teaching methods, a complete theoretical framework of fashion design teaching is constructed, which lays a solid foundation for cultivating high-quality fashion design talents to meet the needs of the times.

4. The theoretical construction of AI-empowered fashion design creation mode

In the view of ICH, AI technology is profoundly changing the creative mode of fashion design. By constructing a brand-new theoretical framework, we can better combine AI technology with fashion design and creation, and realize the innovative expression and inheritance of ICH. This theoretical construction mainly revolves around three key links: creative generation, process optimization and personalized customization.

4.1. AI-based fashion design creative generation mode

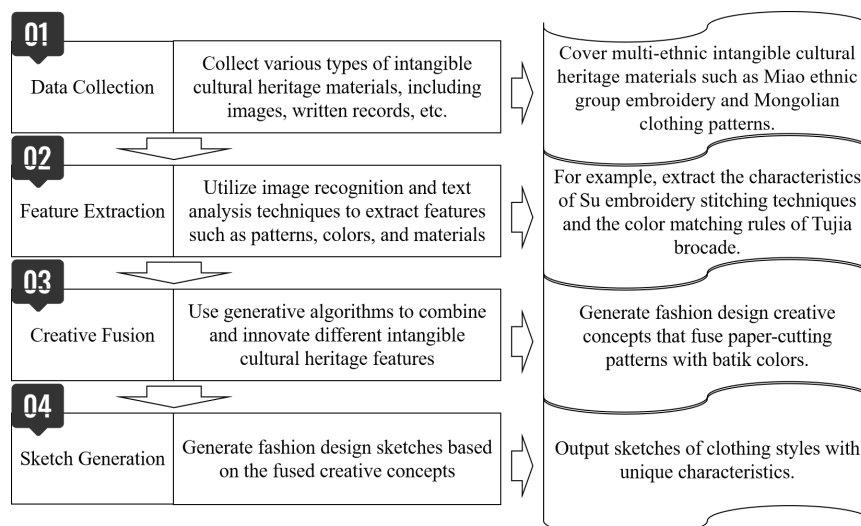| 01 Data Collection | Collect various types of intangible cultural heritage materials, including images, written records, etc. | Cover multi-ethnic intangible cultural heritage materials such as Miao ethnic group embroidery and Mongolian clothing patterns. |
02 Feature Extraction	Utilize image recognition and text analysis techniques to extract features such as patterns, colors, and materials	For example, extract the characteristics of Su embroidery stitching techniques and the color matching rules of Tujia brocade.
03 Creative Fusion	Use generative algorithms to combine and innovate different intangible cultural heritage features	Generate fashion design creative concepts that fuse paper-cutting patterns with batik colors.
04 Sketch Generation	Generate fashion design sketches based on the fused creative concepts	Output sketches of clothing styles with unique characteristics.

Figure 1 AI generates creative flow chart of fashion design based on ICH elements

With its powerful data processing and algorithm model, AI technology provides a brand-new way for the creation of fashion design ideas. Based on ICH elements, AI can explore the potential design inspiration by analyzing massive cultural data. Through in-depth learning of ICH clothing patterns, colors, materials and other data from different regions and ethnic groups, AI can generate creative sketches that integrate various ICH elements. Figure 1 shows the process of AI generating fashion design ideas based on ICH elements.

This creative generation mode breaks the thinking limitation of traditional designers and brings more diversified and innovative ideas to fashion design.

4.2. AI-aided garment design process optimization

In the process of fashion design and creation, AI technology can optimize all links and improve the efficiency and quality of creation. From design concept to finished product making, AI can play many roles.

In the process of fabric selection, AI can recommend the most suitable fabric by analyzing the fabric database according to the design requirements and ICH characteristics. If you design a garment with elements of Dai bamboo weaving, AI can recommend a light, breathable fabric with natural texture according to the texture and style of bamboo weaving (see Figure 2).

Figure 2 Clothing design and display integrating Dai bamboo weaving elements

In the pattern design stage, AI can quickly generate a pattern that conforms to ergonomics and incorporates ICH elements with the help of human body scanning data and the database of the pattern. Designers can make fine adjustments on this basis, greatly shortening the design time and improving the design accuracy. Through these optimizations, the fashion design process is more efficient and scientific, and at the same time, the ICH characteristics are better preserved and displayed.

4.3. AI helps to realize personalized customized clothing design

With the increasing demand of consumers for personalized clothing, AI plays a key role in personalized custom clothing design. By collecting information such as consumers' body data, style preferences and their love for ICH elements, AI can generate a completely personalized clothing design scheme. Consumers can input their own needs through the online platform, and the AI

system instantly generates multiple sets of first draft designs integrating ICH elements for consumers to choose from. Consumers like the colors of Yi lacquerware, and prefer simple dresses. AI can quickly generate several simple dress designs that use the red and black main colors of Yi lacquerware. This personalized customization mode meets consumers' demand for unique clothing, and allows ICH to be passed down and spread in a way closer to public life.

Through the theoretical construction of AI-based creative generation, process optimization and personalized customization, a complete AI-enabled fashion design creation model is formed, which provides strong support for the innovative development of ICH in modern fashion design.

5. Conclusions

In this paper, the teaching and creative mode of AI-empowered fashion design is studied in depth from the perspective of ICH, and a relatively systematic theoretical system is constructed. In terms of teaching, AI promotes the teaching goal to shift from simple skill imparting to comprehensive talents, which cultivates innovation and interdisciplinary ability. Enrich teaching content with AI, dig deep into ICH elements, and generate innovative design content. At the same time, relying on AI to innovate teaching methods, we can realize personalized learning path planning and create a virtual practice teaching environment to improve students' learning effect and practical ability. In the creative mode, AI-based creative generation breaks the limitations of traditional thinking and generates unique creative sketches by analyzing massive ICH data. AI helps to optimize the fashion design process, from fabric selection to pattern design, so as to improve the creative efficiency and quality. Moreover, AI helps to realize personalized customized clothing design, meet consumers' demand for unique clothing, and make ICH closer to public life.

To sum up, the integration of AI with ICH and fashion design is of great significance. It not only provides theoretical guidance for the teaching reform of fashion design, but also opens up a new path for creative practice. However, at present, this field is still in the development stage. In the future, it is necessary to further explore the way of deep integration of AI and traditional design to overcome the challenges in technology application. In this way, we can realize the more extensive and in-depth inheritance and innovation of ICH in the field of fashion design, and push the fashion design industry to a new height.

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