www.cad-journal.net
Computer-Aided Design AND APPLICATIONS™

Research on the Application of Artificial Intelligence in the Field of National Costume Design

Zhao Huiying[1,2], Zhang Xinyue[1,*],Jiao Honglei[3] and Tao Hong[3]

[1]Lu Xun Academy of Fine Arts, Shenyang, China zhaohuiying@lumei.edu.cn
[2] Zhejiang Sci-Tech University, Hangzhou, China
[1]Lu Xun Academy of Fine Arts, Dalian, China zxypapermail@163.com
[3] College of Information and Communication Engineering, Dalian Nationalities University, China, 2507594581@qq.com,1700966159@qq.com

Corresponding author: Zhang Xinyue, zxypapermail@163.com

Abstract. This article adopts an artistic perspective to examine the innovative potential of ethnic minority costumes and explores the ways in which artificial intelligence technology can be harnessed to promote and preserve these traditional forms of dress. The paper begins by providing a brief overview of the current development status of ethnic costumes and the necessity of protection. It then proposes innovative ideas for using neural networks to transfer ethnic pattern styles and adversarial networks to generate patterns for specified parts and conducts comprehensive experiments. The experimental results demonstrate that the style transfer algorithm and adversarial network algorithm employed in this article are highly effective in meeting the requirements of clothing design and offer novel and innovative approaches to the integration of national costume art and modern technology.

Keywords: Artificial intelligence; National costumes; Clothing design
DOI: https://doi.org/10.14733/cadaps.2025.768-781

1 INTRODUCTION

Ethnic costumes are defined as the distinctive attire of a particular ethnic group within its cultural context. Such garments may also be designated as local or national costumes [15]. These costumes represent not merely clothing items but rather complex cultural artifacts that embody collective memory, social values, and aesthetic traditions of ethnic groups. The aesthetic language expressed through these costumes encompasses multiple dimensions, including visual elements, cultural symbolism, and creative interpretation.

Since the 1970s, the evolution of ethnic costumes has been characterized by a complex interplay of positive and negative experiences. The evolution of ethnic costumes has encompassed a transition from familial production to the establishment of modest workshops and, subsequently, the advent of comprehensive industrialization. This transformation process reflects not only changes in

© 2025 U-turn Press LLC, http://www.cad-journal.net

production methods but also the evolution of aesthetic consciousness and creative expression in ethnic costume design. The traditional creative process, which once relied heavily on individual craftsmen's interpretation of cultural elements and their artistic innovation, is now facing new challenges and opportunities in the era of industrial production.

The demand from the general public for distinctive and personalised clothing is constantly increasing. The number of private customisation orders for ethnic costumes continues to increase at a significant rate. This growing demand reflects a deeper cultural phenomenon: the public's desire for clothing that carries cultural meaning while remaining relevant to contemporary life. This presents both a challenge and an opportunity for innovative approaches to ethnic costume design.

However, as economic globalization has intensified, national costumes have encountered significant obstacles on the path to development. The traditional clothing culture of numerous ethnic groups has gradually diminished as a result of the collision with modern civilization. This cultural collision raises fundamental questions about the nature of style and creativity in ethnic costume design. Style, in this context, should be understood not merely as visual patterns but as a complex system of cultural expression that encompasses aesthetic principles, symbolic meanings, and creative interpretation.

The preservation and evolution of ethnic costume styles present multifaceted challenges in the contemporary context. Traditional styles in ethnic costumes embody complex cultural codes that carry historical memory and cultural identity, making the process of style transfer particularly challenging while maintaining authenticity. Moreover, the creative process in traditional ethnic costume design demands a profound understanding of cultural elements and their innovative reinterpretation, raising questions about achieving genuine creativity that respects traditional elements while enabling contemporary expression. As artificial intelligence enters the field of design, there is a pressing need to understand how technological tools can support rather than supplant human creativity in ethnic costume design, particularly in preserving the cultural essence while facilitating innovation.

In recent years, the role of artificial intelligence in the field of literary and artistic creation has been subjected to extensive examination. While enhancing the methods and forms of literary and artistic creation, it has also had a significant impact on traditional concepts and forms within these domains. In the process of integrating technology and traditional art, a number of arguments have emerged that posit a dichotomy between the two domains. The integration of AI in ethnic costume design requires a theoretical framework that addresses both the technical aspects of style transfer and the cultural dimensions of creative innovation.

From a theoretical standpoint, the concept of "style" extends beyond superficial visual attributes, encompassing deep-rooted aesthetic languages that encode cultural identity, symbolic meaning, and historical continuity. In traditional ethnic costumes, style is not merely a set of patterns or colors; it represents a codified visual grammar that communicates cultural narratives, values, and emotional resonance. This understanding of style as a cultural language system is crucial for developing AI approaches that can truly contribute to the field of ethnic costume design.

This study employs artificial intelligence in conjunction with clothing design, encompassing three research areas: firstly, the extraction of traditional national costume silhouettes, colours and details; secondly, the utilisation of neural networks to transfer pattern styles and generate adversarial network pairs; thirdly, the adaptation of pattern generation and the generation of modern clothing with national style characteristics. The research aims to develop a framework that not only preserves traditional styles but also enables genuine creative innovation in ethnic costume design through the thoughtful application of artificial intelligence.

© 2025 U-turn Press LLC, http://www.cad-journal.net

2 RELATED WORK

2.1 Image Style Transfer

The theoretical understanding of style in traditional images encompasses both perceptual characteristics and intrinsic properties of artistic media. The style of an image can be defined as the specific techniques and elements, such as strokes, colors, and other visual information, that are employed in its creation. The content of an image can be defined as the semantic information conveyed by the image, which can be understood as the objects depicted within the image.

As illustrated in Figure 1, while both the ink painting and the photographic representation depict the same horse (identical content), their stylistic expressions differ markedly. This distinction arises from the fundamental properties of the artistic medium itself, particularly the interaction between ink and paper, as demonstrated in recent studies by Wang [14]. The resulting style emerges not merely from pattern composition, but from the inherent characteristics of the medium and its application.

Figure 1: Style transfer renderings.

The objective of style transfer is to reproduce the style of one image on another image. In particular, it concerns the application of the perceptible visual effects of colors, textures, lines, and so forth in diverse artistic works to ordinary photographs, with the objective of creating images that are akin to those produced through the same brushstrokes and techniques, yet with the content remaining identical.

The evolution of style transfer methodologies has witnessed significant advancement through the integration of deep learning techniques. In 2015, Gatys et al.[6] conducted in-depth research on style transfer and creatively used convolutional neural networks to achieve style fusion of two images. Gatys et al. employed the pre-trained VGG network to differentiate between features and content as well as style. In light of these findings, the Gram matrix was employed to quantify the features, and finally, the convolutional neural network was utilized to perform reverse operations, thereby achieving style migration. On the basis of previous work, Justin Johnson and others proposed a method for rapid image style transfer [8]. The saving of the various parameters generated during the process of feature separation using the pre-trained model allows for the achievement of the objective of only needing to train the same style of image once. This method significantly reduces the time required for style migration, enhances work efficiency, and is an effective solution for national costume style migration.

The network structure of fast style transfer is comprised of two principal components. These are the "Image Transform Net" and the "Loss Network," respectively. Figure 2 illustrates the network structure of the fast style transfer model.

Recent developments in style transfer have expanded beyond surface-level visual attributes to incorporate a deeper understanding of how artistic media influence style formation. This advancement, supported by contemporary research in artistic medium analysis [3], has enhanced our ability to preserve and transfer the essential qualities of traditional artistic styles while maintaining their cultural authenticity.

© 2025 U-turn Press LLC, http://www.cad-journal.net

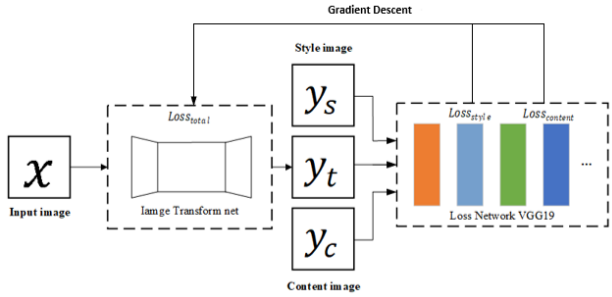

Figure 2: Fast style transfer network structure.

2.2 Generative Adversarial Network

The emergence of Generative Adversarial Networks (GANs) has precipitated a fundamental transformation in the computational approach to creative content generation, particularly in the domain of artistic and cultural expression. In 2014, Ian J. Goodfellow and colleagues proposed the Generative Adversarial Network (GAN)[7], which marked a significant advancement in the integration of AI into the domain of content generation. As illustrated in Figure 3, the network comprises a generative model and a discriminative model. The principal objective of the generative model is to generate an image that will challenge the discriminative model to the greatest extent possible. The principal objective of the discriminative model is to ascertain whether the image generated by the generative model is an authentic representation to the greatest extent possible. The process can be described as follows: the two models engage in a confrontation and competition with one another.

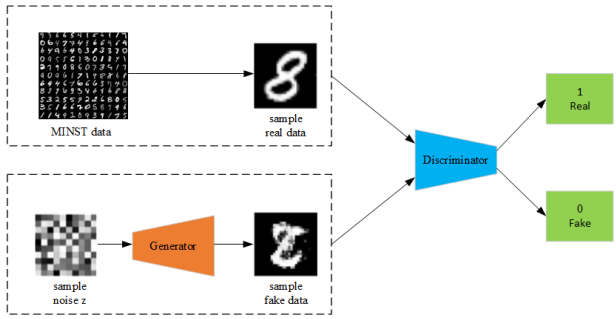

Figure 3: Generative adversarial network structure.

The advent of generative adversarial networks (GANs) has undoubtedly become a focal point in the field of deep learning research in recent years. This is largely due to the ingenious network design of mutual confrontation and mutual games, as well as the significant improvement in production efficiency in various practical scenarios. During the process of exploration, numerous variants have been produced. These include conditional generative adversarial networks (CGANs)[11], which incorporate conditional variables to regulate the generation of results; InfoGAN [4], which has been optimized from the perspective of information theory and improved generative adversarial network optimization objectives. W-GAN [2].

A significant advancement in GAN architecture emerged with the development of conditional models. In light of the theoretical framework put forth by Goodfellow et al., Mirza et al. advanced the concept of Conditional Generative Adversarial Nets, which they designated as Conditional

© 2025 U-turn Press LLC, http://www.cad-journal.net

Generative Adversarial Networks (CGAN). As illustrated in Figure 4, the network architectures of CGAN and GAN exhibit a high degree of similarity. The sole distinction between the original GAN and its subsequent iteration is the incorporation of a conditional variable, y, into the construction of both the generative and discriminant models. In practical applications, the presence of this conditioning variable serves to constrain the training process, thereby rendering the GAN a form of supervised neural network. When the objective is to generate results, conditional generative adversarial networks represent an optimal solution.

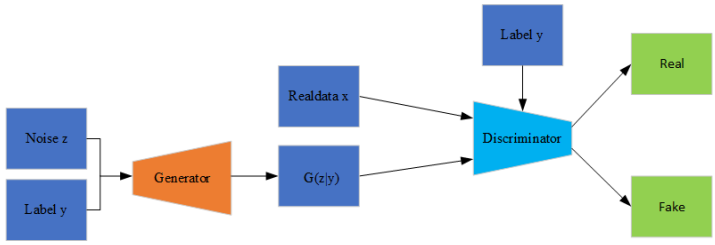

Figure 4: Conditional generative adversarial network structure.

Recent research has further incorporated the notions of cultural authenticity and creative exploration into Generative Adversarial Network (GAN)-based frameworks. This integration represents a crucial development in the field of computational creativity, as it addresses the fundamental challenge of balancing artistic innovation with cultural preservation.

The application of GANs in cultural heritage preservation and artistic creation has led to innovative developments in computational creativity. Notably, Creative Adversarial Networks (CANs) [5] demonstrate the potential for AI systems to generate content that maintains cultural authenticity while introducing novel artistic elements. In the realm of ethnic costume design, this technology enables the creation of patterns and motifs that preserve traditional aesthetic principles while incorporating contemporary design elements. The integration of cultural knowledge as conditional variables allows GANs to achieve a sophisticated balance between historical authenticity and creative innovation, contributing to the sustainable development of traditional artistic expressions in the modern context.

3 NEW IDEAS FOR ETHNIC COSTUME DESIGN

The phenomenon of clothing can be considered a distinctive cultural construct. The fundamental characteristics of clothing are sufficient to comprehensively describe the appearance of a given item of clothing. The fundamental characteristics of clothing encompass a range of elements, including the type, raw materials, specifications, patterns, and styles. These characteristics represent a sophisticated system of cultural expression that operates through multiple dimensions of design and craftsmanship. This article introduces an innovative approach to examining the two fundamental elements of pattern and style within the context of clothing design. It proposes a novel method for creating national style images through style transfer and employs a generative adversarial network to regulate the generation of pattern components.

In the development of advanced design strategies for ethnic costume patterns, it is imperative to recognize that "style" transcends mere surface aesthetics, functioning instead as an encoded cultural "language" that conveys collective memory, societal values, and symbolic meanings. This cultural encoding manifests through the thoughtful selection and arrangement of design elements, the preservation of traditional techniques, and the adaptive interpretation of historical patterns. Consequently, the design process must strive to preserve and reinterpret these intangible cultural codes in a manner that remains faithful to their historical foundations while simultaneously

© 2025 U-turn Press LLC, http://www.cad-journal.net

addressing contemporary sensibilities. Furthermore, "creativity" within this context extends beyond the generation of visually novel patterns; it encompasses the cultivation of cultural expressions that honor the heritage of ethnic attire while adeptly adapting its motifs, colors, and structures to new contexts.

3.1 Graphic Design

A review of contemporary fashion shows and everyday attire reveals a paucity of ethnic minority elements in current clothing design. Accordingly, from a design perspective, the style of ethnic clothing elements can be personalized, including colors, textures, and other characteristics.

The initial step is to select the style images. The vibrant hues characteristic of ethnic attire can be employed in the creation of contemporary patterns, thereby imparting a heightened sense of individuality to the garments. In the process of clothing design, the new content images can be refined and optimized by selecting different ethnic elements to ensure that the overall color of the clothing exhibits a combination of traditional and modern characteristics. For example, the Dong people in the Late Village typically utilize white and bright colors, such as cyan and blue, which are frequently employed as primary hues. These colors are visually striking, elegant, and distinctive. When combined with other intricate patterns, the two are seamlessly integrated to form new patterns that are simultaneously sophisticated and contemporary, imparting a striking visual impact and exemplifying an innovative approach to incorporating ethnic elements. Figure 5 enumerates the textures of select traditional ethnic costumes.

Figure 5: Texture of traditional ethnic costumes.

Secondly, the selection of content images is of significant importance—the judicious use of graphics in national costumes. A variety of graphical elements are present in national costumes. As an illustration, the graphical elements present in Miao attire encompass floral motifs, vegetal forms, entomological subjects, aquatic creatures, and mythological figures such as dragons. These graphics provide a comprehensive representation of the migratory experiences of the Miao people throughout history and their evolving responses to migration. The concept of reverence for the natural world can be effectively integrated into the design of contemporary attire. Such graphics can be employed as content images in style transfer work. This combination represents a synthesis of diverse ethnic elements, showcasing a novel approach to fashion design.

3.2 Pattern Generating Part

As illustrated in Figure 6, the decorative elements of the pattern are classified into the following categories: overall decoration, collar, cuffs, hem, chest, back, and other locations.

© 2025 U-turn Press LLC, http://www.cad-journal.net

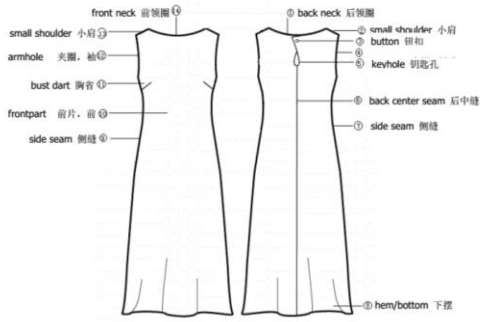

Figure 6: Illustration of long skirt parts.

The study [12] revealed that the strategic placement of design patterns on specific, attention-grabbing areas of clothing can enhance its visual appeal. Patterns and logos are typically positioned on the front of the garment, such as the chest and waist, with the intention of showcasing the brand, promotional campaign, or design theme. Typically, an item is positioned on the reverse of the garment with the intention of creating a lasting impression on the wearer. Patterns on the sleeves of garments can serve to add visual layering and enhance the three-dimensional quality of the item.

4 EXPERIMENT

4.1 Experimental Environment

This experiment was conducted on a 64-bit Windows 10 Professional Edition system, utilizing the Python 3.6 programming language and the TensorFlow deep learning framework to construct a network model. The NVIDIA GeForce RTX 3060 GPU was the primary device employed for training and testing the model.

4.2 Data Set

In the convolutional neural network component, the data set employs Microsoft's COCO2014 [10] training set, comprising a total of 82,783 images, as illustrated in Figure 7.

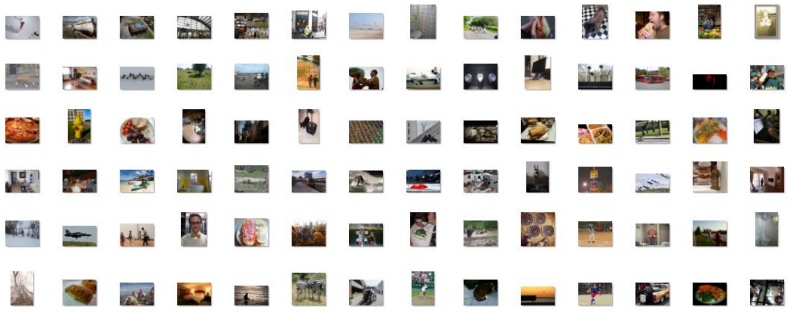

Figure 7: MSCOCO2014 data set.

In the generative adversarial network, the Clothing-Dataset dataset [1] is selected as the source of the real data input into the discriminant network. Figure 8 illustrates a selection of the data set in

© 2025 U-turn Press LLC, http://www.cad-journal.net

the form of representative images. The data set comprises over 5,000 images of clothing, encompassing 20 distinct categories.

Figure 8: Clothing data set.

4.3 Clothing Template Selection

In the field of clothing design, the various techniques employed, including printing, embroidery, and the use of rhinestones and other similar processes, serve to enhance the overall visual appeal of the garment. Such embellishments must be dependent on the base garment to demonstrate the desired design effect. In this article, the pattern and pattern placement are designed in an innovative manner, thereby reducing the number of requirements for the clothing template. Two common styles of clothing are selected for analysis: the long dress and the blank T-shirt. Both template formats are in JPG image format and are also in FBX format, which is necessary for 3D processing. Figure 9 illustrates the renderings of the two templates.

Figure 9: Clothing blank template.

4.4 Constructing a Convolutional Neural Network to Achieve Style Transfer

This article employs a rapid style transfer model. The complete network training procedure is illustrated in Figure 10. The loss network is constructed using the VGG19[13] model. In comparison to the AlexNet [9] model, which represents the earliest training model, the VGG19 model demonstrates a superior evaluation effect with respect to the VGG network. The results are excellent, with lower losses and improved accuracy. However, as a consequence of these optimizations, the network depth is greater than that of AlexNet and comprises a larger number of parameters. During operation, the program will require more computer resources and memory.

The image calculations are performed on the feature maps of the RELU3_3 and RELU4_3 layers, while content loss is calculated on the RELU4_3 layer. The calculation of content loss can be

© 2025 U-turn Press LLC, http://www.cad-journal.net

performed directly by selecting the difference in the Euclidean distance of the pixels of the feature map.

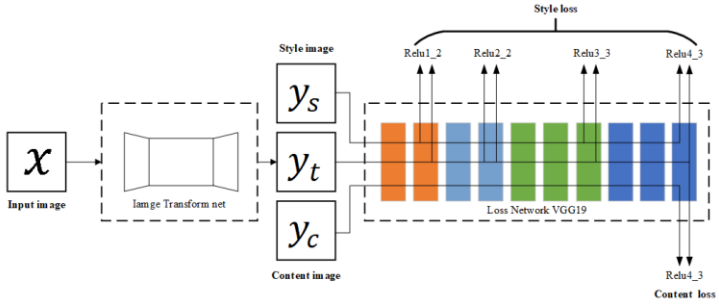

Figure 10: Fast style transfer model network.

In contrast, the style loss requires the Gram matrix of the feature map of the style map and the generated map to be calculated separately, and then the Euclidean distance to be calculated. The generation network is optimized through gradient descent, whereby the loss value and style loss value are minimized, thus ensuring that the network ultimately reaches the target requirements.

4.5 Construct a Conditional Generative Adversarial Network

Following the completion of the work involved in transferring the style of national costumes, we proceeded to construct a generative adversarial network with the objective of designing the generation parts of the patterns. This was done with the intention of further aligning the generated clothing products with public aesthetic standards.

The initial step is to ascertain the specific type of garment and the requisite textile components that require pattern generation. For instance, if the objective is to generate a pattern on a T-shirt, it would be advisable to affix the pattern to the front of the garment. Subsequently, the pertinent data sets are assembled based on the selected mapping components. To illustrate, should one desire to generate a pattern on the front of a T-shirt, one may collate a data set comprising images of the front of the T-shirt.

It is recommended that conditional generative adversarial networks be employed for training purposes, with the objective of generating patterns that meet the specified conditions. During the training process, the map part must be input into the generator as a condition to guarantee that the generated pattern can adapt to the characteristics of the map part. Upon completion of the training phase, the generator can be utilized to generate patterns with varying styles, which can then be applied to the mapped regions. Concurrently, the generated effect may be optimized by adjusting parameters such as the position and size of the map parts.

It is important to note that when selecting the mapping parts, consideration should be given to the overall coordination and balance of the pattern and clothing. This ensures that the generated pattern and clothing complement each other and achieve better visual effects.

4.6 Experimental Results

4.6.1 Style Transfer

The embroidered backstrap cover piece of the Taiqing and Turbidity two qi patterns of the Dong ethnic group was selected as the original style image, and the peacock was chosen as the target image for training. The training process involved a total of 20 epochs, with each epoch representing a traversal of all the images in the dataset. The effect of the migration of three epochs was observed and is illustrated in Figure 11.

© 2025 U-turn Press LLC, http://www.cad-journal.net

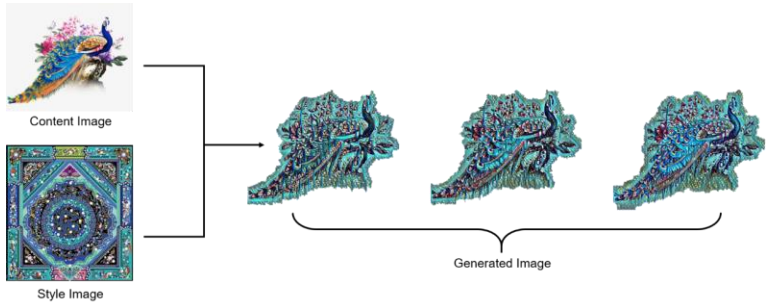

Figure 11: Transfer results for the embroidered backpack cover piece with the Taichung and Turbulence two qi patterns.

In the second migration experiment, the Dong nationality's banyan tree flower embroidery cover pattern was selected as the original style image. The resulting effect is illustrated in Figure 12.

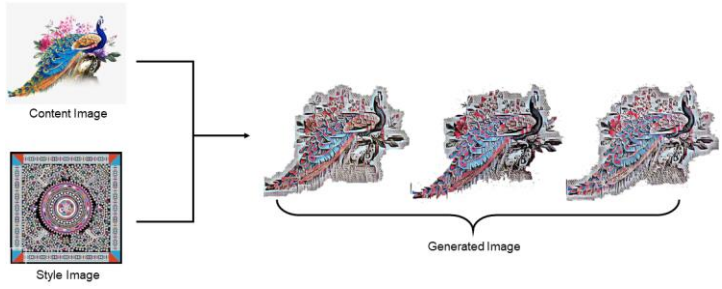

Figure 12: Transfer results of banyan tree flower embroidery cover pattern.

The image on the left side of the above picture represents the content image, while the image on the right side represents the style image. The image on the right side was generated through three iterations. It is evident that the chromaticity of the initial and subsequent images is more saturated, and the cumulative effect is more aligned with the original style image. Following the third iteration, the color is more vibrant and more closely aligns with the proportion observed in the content and style images. The value is 50%. At this juncture, the results of the image style transfer are presented in Figure 13.

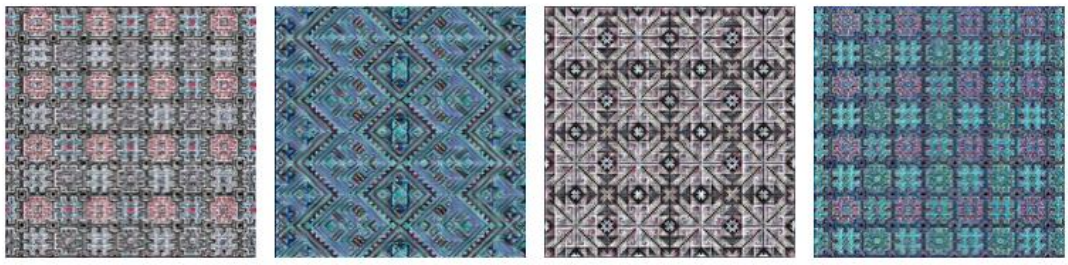

Figure 13: Multi-ethnic style texture transfer results.

© 2025 U-turn Press LLC, http://www.cad-journal.net

4.6.2 Part Selection

By inputting a dataset of actual clothing items into a generative network, the generative network utilizes the dataset to generate authentic data. Subsequently, the part label that oversees the pattern generation process and the output of the generation model G are fed into the discriminant model D. The discriminant model D is tasked with differentiating the generated data from the authentic clothing data. Subsequently, the algorithm is employed to adjust the trained weight values, and then multiple loops are executed to generate an image at each 10th calculation. The final confrontation results are illustrated in Figures 14 and 15.

Figure 14: Clothing constraint confrontation results.

Figure 15: Clothing constraint confrontation results.

4.6.3 Results Validation

Our research employed a comprehensive validation approach to evaluate the effectiveness of the proposed method in preserving ethnic cultural elements while meeting contemporary design standards. We assembled an expert panel comprising eight specialists in relevant domains, including five ethnic costume design experts with extensive experience and three cultural heritage preservation specialists, to conduct detailed assessments of the generated designs.

The validation process examined multiple aspects of the generated designs through systematic evaluation criteria. The assessment considered the preservation of traditional elements and symbolic significance, the successful integration of contemporary aesthetic principles, and the potential for practical application in modern fashion contexts. To ensure comprehensive evaluation, we developed a five-point scale assessment system that enabled detailed quantitative analysis of these key aspects.

Evaluation Criteria	*Mean Score*	*Standard Deviation*
Cultural Authenticity	4.25	0.46
Design Innovation	4.12	0.35

© 2025 U-turn Press LLC, http://www.cad-journal.net

Technical Execution	4.38	0.52
Overall Assessment	4.25	0.44

Table 1: Expert Evaluation Results (n=8).

To complement the expert evaluation, we conducted an extensive user survey involving 100 participants, equally divided between general consumers and fashion industry professionals. This balanced composition allowed us to gather insights from both potential end-users and those with professional expertise in contemporary fashion trends. The survey focused on assessing the practical appeal and market potential of the generated designs.

Assessment Category	*General Consumers (n=50)*	*Fashion Consumers (n=50)*	*Combined*
Cultural Recognition	75.4%	82.6%	79.0%
Aesthetic Appeal	83.2%	88.4%	85.8%
Purchase Intent	77.8%	84.2%	81.0%
Satisfaction Index	82.4%	89.0%	85.8%

Table 2: User survey results (N=100).

The quantitative analysis revealed significant correlations between cultural authenticity and contemporary appeal ($r=0.78$, $p<0.01$). The high mean scores across all evaluation criteria (exceeding 4.0) demonstrate the effectiveness of our approach in achieving both cultural preservation and modern design integration. Fashion professionals showed particularly strong appreciation for the technical execution and innovative aspects of the designs, while general consumers responded positively to the overall aesthetic appeal and wearability.

The statistical analysis revealed no significant disparity between the assessments of general consumers and fashion professionals ($\chi^2=3.24$, $p>0.05$), suggesting broad market potential. The combined satisfaction index of 4.29/5 further validates our approach's success in creating designs that resonate with both general consumers and industry professionals while maintaining cultural authenticity.

These empirical results demonstrate our method's effectiveness in bridging traditional ethnic costume elements with contemporary fashion requirements, suggesting significant potential for practical application in modern fashion design.

5 DEVELOPMENT PROSPECTS

5.1 Advantages of Artificial Intelligence in National Costume Design

The integration of ethnic costume design and artificial intelligence presents significant opportunities for innovation in traditional garment creation. The utilization of AI technologies, particularly image recognition and generative adversarial networks, enables efficient generation, modification, and optimization of ethnic costume patterns. This technological advancement substantially reduces designers' workload while enhancing design efficiency and creative innovation potential.

The application of artificial intelligence in ethnic costume design also enables sophisticated personalization capabilities, efficiently generating diverse clothing solutions that align with varying consumer requirements. This integration of AI and traditional design methodologies can create considerable innovation opportunities and enhance production efficiency [16], though it requires sustained collaboration between designers and technical specialists to achieve optimal results.

© 2025 U-turn Press LLC, http://www.cad-journal.net

5.2 Disadvantages of Artificial Intelligence in National Costume Design

Despite the ability of AI to rapidly generate and modify patterns, its absence of human aesthetic judgment and experience renders it challenging to ascertain whether the generated patterns align with the aesthetic and cultural characteristics of national costumes. In regard to the dataset, the training of AI necessitates a substantial quantity of data to facilitate effective learning. The quality and quantity of the dataset directly influence the training outcome. The limitations of the dataset in the field of national costume design may result in suboptimal training outcomes or the inability to meet the design requirements. The deployment of artificial intelligence technology in the field of national costume design necessitates the involvement of professional technicians and software support, which may potentially increase the learning costs and work difficulty of designers.

Furthermore, the demand for computational resources and algorithm optimisation will also lead to increased design costs and time requirements. Despite the capacity of AI to deliver personalised customisation of ethnic clothing, the solutions, and styles it generates may lack innovation and personalisation, and thus fail to meet the needs of different consumers. In conclusion, while AI has numerous prospective applications in the domain of ethnic apparel design, it is imperative to pursue unceasing innovation and optimisation in three key areas: technology, data and human capital. This will enable the overcoming of the limitations and challenges currently associated with AI, and facilitate the realisation of its full potential and value.

6 CONCLUSIONS

This article employs deep learning technology in artificial intelligence to integrate style transfer and generative adversarial networks with the domain of clothing design. The silhouette, color, and detail elements of traditional ethnic costumes can be extracted, integrated, and recreated with modern clothing design. This process allows for the exploration of new directions for the innovative design of ethnic costumes. In addition to the promotion and inheritance of national traditions, this approach also satisfies the demand for high-quality clothing. In the contemporary era, the integration of artificial intelligence into national culture is conducive to enriching the contemporary aesthetics of national costume art and injecting strong scientific and technological vitality into the comprehensive revitalization of national culture, given the rapid development of science and technology.

ACKNOWLEDGMENTS

This project was funded by the Key Laboratory of Silk Culture Heritage and Products Design Digital Technology, Ministry of Culture and Tourism, P.R. China.

REFERENCES

[1] Alexey, G.: Clothing Dataset [DB/OL], 2021 [2024-7-24], https://github.com/alexeygrigorev/clothing-dataset.

[2] Arjovsky, M.; Chintala, S.; Bottou, L.: Wasserstein GAN, ArXiv:1701.07875, 2017. https://doi.org/10.48550/arXiv.1701.07875

[3] Chen, G.: Research on the Reference of Traditional Ink Painting Elements in Chinese Watercolor Painting, Proceedings of the 2nd International Conference on Culture, Design and Social Development (CDSD 2022), Atlantis Press, 2023, 470-476.https://doi.org/10.2991/978-2-38476-018-3_53

[4] Chen, X.; Duan, Y.; Houthooft, R.; Schulman, J.; Sutskever, I.; Abbeel, P.: InfoGAN: Interpretable Representation Learning by Information Maximizing Generative Adversarial Nets, Proceedings of the Advances in Neural Information Processing Systems, 29 (NIPS 2016), Barcelona, Spain, 2016. https://doi.org/10.48550/arXiv.1606.03657

[5] Elgammal, A.; Liu, B.; Elhoseiny, M.; Mazzone, M.: CAN: Creative adversarial networks generating 'art' by learning about styles and deviating from style norms, in International

© 2025 U-turn Press LLC, http://www.cad-journal.net

Conference on Computational Creativity (ICCC), 2017. https://doi.org/10.48550/arXiv.1706.07068

[6] Gatys, L.; Ecker, A.; Bethge, M.: A Neural Algorithm of Artistic Style, Journal of Vision, 16, 2016, 326. https://doi.org/10.48550/arXiv.1508.06576

[7] Goodfellow, I.: NIPS 2016 Tutorial: Generative Adversarial Networks, ArXiv preprint arXiv:1701.00160, 2016. https://doi.org/10.48550/arXiv.1406.2661

[8] Johnson, J.; Alahi, A.; Fei-Fei, L.: Perceptual Losses for Real-Time Style Transfer and Super-Resolution, Springer, Cham, Switzerland, 2016. https://doi.org/10.48550/arXiv.1603.08155

[9] Krizhevsky, A.; Sutskever, I.; Hinton, G.: ImageNet classification with deep convolutional neural networks, Communications of the ACM, 60, 2017, 84-90. https://doi.org/10.1145/3065386

[10] Lin, T.; Maire, M.; Belongie, J. S.; et al.: Microsoft COCO: Common Objects in Context, CoRR, 2014, abs/1405.0312. https://doi.org/10.48550/arXiv.1405.0312

[11] Mirza, M.; Osindero, S.: Conditional Generative Adversarial Nets, Computer Science, 2014, 2672-2680. https://doi.org/10.48550/arXiv.1411.1784

[12] Mo, X.; Sun, E.; Yang, X.: Consumer Visual Attention and Behaviour of Online Clothing, International Journal of Clothing Science and Technology, 2021, 33(3), 305-320. https://doi.org/10.1108/IJCST-02-2020-0029

[13] Simonyan, K.; Zisserman, A.: Very deep convolutional networks for large-scale image recognition, ArXiv preprint arXiv:1409.1556, 2014. https://doi.org/10.48550/arXiv.1409.1556

[14] Wang, Q.: The Application of Ink Art Elements in Modern Cultural and Creative Product Packaging Design, Academic Journal of Science and Technology, 2024, 9(2), 72-76. https://doi.org/10.54097/6nvgmm37

[15] Zhang, J.; Liu, Y.: Research on Western Minorities Costume Culture and Innovative Development--Analysis Based on a Sample Questionnaire on Western Minorities National Costume, Journal of Social Science Humanities and Literature, 6(6), 2023, 5-12.

[16] Zhang, N.: AI promotes the creative transformation of traditional culture, Software and Integrated Circuits, 2023(09), 17. http://doi.org/10.19609/j.cnki.cn10-1339/tn.2023.09.010

© 2025 U-turn Press LLC, http://www.cad-journal.net