

AI-Assisted Practice of Visual Design for Traditional Cultural Symbols

Xiaoyi Wang

Chengdu Academy of Fine art, Sichuan Conservatory of Music, Chengdu Sichuan, 610000, China

Abstract: In the current era where globalization and digitalization are deeply intertwined, cultural diversity is becoming increasingly prominent. As vital carriers of national cultural genes, traditional cultural symbols face the pressing challenge of adapting to modern communication contexts in their inheritance and innovation. The rapid development of artificial intelligence (AI) offers groundbreaking solutions to this dilemma. With its strengths in data processing and pattern generation, AI is profoundly reshaping the creative logic and practical pathways of visual design for traditional cultural symbols. Based on this context, this paper systematically explores the significance of AI-assisted visual design of traditional cultural symbols, analyzes specific applications of image recognition, algorithmic generation, and big data analysis in design practices, and examines core challenges such as misinterpretation of cultural connotations and high technological costs. It further proposes targeted solutions, including enhancing AI's capacity for cultural learning, optimizing technologies to reduce costs, and promoting designer training and mindset transformation, to facilitate the broader dissemination and deeper innovation of traditional cultural symbols in contemporary society.

Keywords: Artificial Intelligence; Traditional Cultural Symbols; Visual Design; Cultural Communication; Technological Applications.

1. Introduction

With the pervasive integration of digital technologies, the carriers and forms of cultural communication have undergone fundamental changes. Traditional modes of cultural transmission are facing practical difficulties such as audience attrition and weakened communication effectiveness. As core elements embodying historical memory, values, and aesthetic preferences of the nation, traditional cultural symbols have become crucial for effective cultural transmission in modern society. Visual design, serving as a key bridge between traditional cultural symbols and modern audiences, transforms abstract cultural connotations into perceptible visual languages. However, traditional design models have increasingly revealed limitations in handling complex symbolic systems and addressing diversified communication demands, such as inefficiency and limited creativity. Leveraging its powerful capabilities in data processing, autonomous learning, and creative generation, AI opens up new possibilities for visual design of traditional cultural symbols. This paper focuses on the integration of AI and traditional cultural symbol visualization, aiming to map the logic of technological application, analyze practical challenges, and explore optimization pathways, thereby contributing to the living inheritance and innovative development of traditional culture.

2. The Importance of Visual Design for Traditional Cultural Symbols

2.1. Facilitating Cultural Communication

The essence of cultural communication lies in the flow and sharing of information among different groups. Traditional cultural symbols encapsulate values and wisdom specific to historical periods, yet their meanings are often hidden and complex. In today's information-saturated environment, modern audiences lack the patience and motivation to

interpret such abstract and esoteric expressions, causing many valuable symbols to become marginalized in communication. Visual design, through the deconstruction and recombination of symbolic forms, transforms them into images, colors, and dynamic visuals that align with contemporary aesthetic norms. This transformation quickly captures audiences' attention and evokes sensory experiences. For instance, the "fish for abundance" motif from traditional paper-cutting can be rendered as a 3D animation, where exaggerated fish movements and striking red-green color combinations, coupled with algorithmic promotion on short video platforms, not only help young viewers instantly grasp its auspicious meaning but also inspire secondary creations and wider social sharing [1-2]. Such transformations break the temporal and spatial constraints of cultural transmission, enabling regional symbols like Shaanbei paper-cutting and Suzhou embroidery patterns to transcend geographical boundaries, evolve into widely recognized cultural markers, and achieve effective dissemination of traditional culture on a larger scale.

2.2. Driving Industrial Innovation

In an increasingly fierce environment of homogenized competition, modern industries urgently need cultural empowerment to achieve differentiated development. Traditional cultural symbols, as creative treasures carrying national memory, provide unique pathways for industrial innovation. Through the modern reinterpretation of symbolic elements, visual design can integrate traditional patterns, totems, and colors into product functions and brand narratives, elevating industrial output from mere functional satisfaction to the provision of cultural experiences.

A representative example in the field of graphic design is the "Forbidden City Bottle" series launched by the beverage brand Nongfu Spring. The design team drew inspiration from traditional symbols found in the Palace Museum's collections, deconstructing and reconstructing elements such as the verdant landscape motifs of *A Panorama of Rivers and*

Mountains and the auspicious cloud patterns from Qing dynasty dragon robes. These were reconfigured onto the bottle labels using a graphic visual language. While retaining the cultural essence of traditional symbols, the team employed flattening techniques to better align the motifs with modern packaging aesthetics. The color scheme centered on imperial tones such as Palace Red and Bright Yellow, paired with minimalist typography for product information, thereby highlighting both the profound historical and cultural connotations and meeting contemporary consumers' aesthetic preference for "Guochao" (national trend) style.

Upon release, the series quickly became a trending topic on social media due to its distinctive visual design. It not only boosted product sales by 30% year-on-year but also spurred exploration of the graphic application of traditional cultural symbols in the fast-moving consumer goods industry, offering a vivid example of cultural innovation driving industrial development.

3. AI-Enabled Approaches to Visual Design of Traditional Cultural Symbols

3.1. Image Recognition for Accurate Extraction of Symbolic Elements

Traditional cultural symbols are preserved across diverse carriers such as ancient woodblock prints, bronze vessel patterns, and folk paper-cuttings. Over time, these symbols have evolved into complex variants, making manual extraction labor-intensive, time-consuming, and prone to subjective bias or misjudgment. Image recognition technology, through multi-layer neural networks, simulates the human visual system's recognition of symbolic features. It begins with high-precision digital scanning of artifacts and then applies algorithms such as edge detection and feature-point matching to isolate patterns, colors, and shapes from complex backgrounds[3-4]. This technology can process tens of thousands of images simultaneously, automatically label parameters of symbolic forms and their frequency, and even detect subtle variants that may escape human observation. For instance, in extracting decorative motifs from Ming and Qing dynasty furniture, image recognition can precisely differentiate between stylistic variations of scroll patterns, creating structured symbolic databases that provide standardized materials for subsequent design work.

3.2. Algorithmic Generation of Diverse Design Styles

Visualizing traditional cultural symbols requires balancing historical inheritance with contemporary aesthetics. The creative capacity and stylistic range of an individual designer are inevitably limited. Algorithmic generation techniques treat extracted symbolic elements as a foundation and, through pre-set design grammars and style-transfer models, can generate dozens or even hundreds of differentiated design schemes within minutes. These outputs include both faithful reproductions of traditional styles and cross-cultural, innovative fusions—for example, combining paper-cutting motifs with minimalist design, or adapting the vivid palette of New Year prints to modern UI specifications. Designers do not need to start from scratch; instead, they can refine algorithm-generated drafts while retaining full control over cultural connotations. At the same time, the algorithm's

"unexpected outputs" stimulate creative inspiration. This model of human-machine collaboration not only boosts efficiency but also breaks free from the limitations of individual experience, allowing traditional cultural symbols to achieve richer and more diversified expressions in modern design.

3.3. Big Data Analysis to Optimize Design Orientation

The value of visual design for traditional cultural symbols depends largely on audience acceptance and market feedback, yet audience preferences and consumption trends are dynamic and difficult to capture through traditional experiential judgment. Big data analysis, by mining data from social media interactions, e-commerce platforms, and other sources, enables the construction of audience profiles and demand models.

An illustrative example is the "Dunhuang Feitian" notebook series launched by the stationery brand M&G. The company applied big data analysis to optimize its design strategy. By extracting discussion data from youth stationery forums and campus social platforms, the design team found that students aged 12–18 preferred covers that combined cultural recognizability with simplicity, showed lower acceptance of overly complex traditional motifs, and favored the integration of Feitian ribbons with zodiac elements. Based on these insights, the design team simplified the lotus patterns from Dunhuang murals, retaining only the flowing curves of the ribbons as the core visual symbol. They replaced the traditional earthy yellow palette with gradient blue and purple tones and incorporated constellation-like star motifs at the ribbon ends.

The optimized cover design preserved the cultural essence of Dunhuang while aligning with the aesthetic preferences of the target group. Within three months of its launch, the notebook series sold over one million copies, becoming a best-seller in the campus stationery market (see Table 1).

Table 1. Comparison of Market Performance Before and After Optimization

Indicators	Traditional design scheme (%)	Datamining analysis scheme (%)
Three-Month Year-on-Year Sales Growth Rate	15	221
Satisfaction Level of 12–18-Year-Old Consumers	62	91
Growth Rate of Topic Discussions on Social Media Platforms	20	398

4. Challenges in AI-Assisted Visual Design of Traditional Cultural Symbols

4.1. Misinterpretation of Cultural Connotations

The value of traditional cultural symbols lies not only in their external forms but also in the historical narratives, folk sentiments, and philosophical insights they embody. Interpreting these connotations often requires contextualization within specific historical circumstances and

cultural environments. When AI processes cultural symbols, its core logic relies on large-scale data for pattern recognition and feature extraction, making it difficult to move beyond superficial “formal imitation” to deeper cultural substance[5-6]. Most algorithmic interpretations remain at the level of quantifying visual elements such as colors, lines, and compositions, without grasping abstract meanings—for example, the imperial authority symbolized by dragon motifs or the moral virtues implied by the “plum, orchid, bamboo, and chrysanthemum.” Such cognitive limitations can directly lead to cultural discontinuities in design outcomes. For instance, funeral-related motifs such as *shouzhongzhengqin* (peaceful end of life) may be mistakenly applied to celebratory designs, or region-specific totemic symbols may be decontextualized and generalized. These misuses not only diminish the symbolic and spiritual value of traditional culture but may also cause confusion in cultural cognition among audiences.

4.2. High Technological Costs

The implementation of AI-assisted visual design for traditional cultural symbols entails significant costs across multiple stages, including high-performance servers, customized algorithm development, and dataset annotation. Given the specificity of traditional cultural symbols, datasets must cover samples from different historical periods and regional schools, requiring considerable investment in image collection and cultural annotation. Moreover, the development of specialized functions such as style transfer for traditional patterns or semantic analysis of symbols necessitates interdisciplinary teams, further increasing research and development expenses. These high costs make it difficult for small- and medium-sized design enterprises or independent designers to adopt such technologies, concentrating resources within a handful of large institutions. This cost barrier limits the widespread application of AI in cultural and creative industries, restrains the overall innovation efficiency of the sector, and hinders large-scale technological iteration and cost optimization, creating a cyclical bottleneck.

5. Pathways for AI-Assisted Visual Design of Traditional Cultural Symbols

5.1. Enhancing AI’s Cultural Learning

AI’s handling of traditional cultural symbols often results in shallow cognition, where formal reproduction is disconnected from cultural connotations due to insufficient understanding of historical contexts and folk meanings. This not only weakens the cultural value of design works but also risks misuse of symbols. Addressing this bottleneck requires strengthening AI’s cultural learning (see Table 2). Researchers can systematically organize materials such as ancient texts, intangible heritage lineages, and ethnographic records to build structured cultural knowledge bases containing the origins, evolutionary trajectories, and symbolic frameworks of cultural motifs. These should serve as core data sources for model training. By enabling AI to engage in deep learning of culturally annotated materials, it can link extracted symbolic elements with their cultural logic. Moreover, a dynamic feedback mechanism should be established whereby designers evaluate the cultural appropriateness of algorithm-generated results and feed

corrected data back into the model, driving iterative improvements in AI’s interpretive accuracy of cultural meanings.

Table 2. Approaches to Strengthening AI’s Cultural Learning

Specific approaches:	Content description
Build a structured cultural knowledge base	Sort out ancient books, intangible cultural heritage genealogies, etc., and build a knowledge base containing the origin, evolution, and symbolism of symbols as the core data for model training.
Deeply learn cultural annotation materials	Let artificial intelligence learn with culturally annotated materials, and when extracting symbols, associate the underlying cultural logic.
Establish a dynamic feedback mechanism	Designers annotate the cultural rationality of the algorithm results, and feed back the corrected data to the model to help it iterate and improve the interpretation accuracy.

5.2. Optimizing Technology and Reducing Costs

The high cost threshold of AI-assisted visual design for traditional cultural symbols hinders its wider adoption, especially among smaller design institutions and independent creators. To address this, both technological optimization and cost control are necessary. R&D teams can focus on lightweight algorithm design by adopting methods such as model compression and parameter optimization, thereby reducing dependence on high-end hardware and improving the efficiency of ordinary devices. Modular development of reusable functions—such as symbol recognition and style transfer—can also lower repetitive R&D costs. In addition, government agencies can provide financial support and build public technological service platforms to reduce expenses for enterprises and individual creators. Such measures would promote the inclusive application of AI in the field of traditional cultural design[7].

5.3. Designer Training and Cognitive Transformation

As AI penetrates deeply into the design field, traditional designers’ knowledge structures and working models face major challenges. Many designers, long reliant on experiential accumulation and subjective creativity, lack systematic understanding of AI’s algorithmic logic and data-processing methods. This can lead to underutilization of AI’s potential in collaboration or misconceptions such as over-reliance on technology or fear of creative replacement. Reforming design education is thus essential[8-9]. Curricula should incorporate interdisciplinary courses on AI design principles and cultural data visualization to cultivate both technical proficiency and humanistic thinking. Enterprises should also establish regular training mechanisms to help designers master intelligent tools and collaborative skills. Most importantly, designers need to embrace a mindset shift that reaffirms their leading role in creation: AI should be responsible for technical tasks such as data processing and style generation, while designers focus on precise interpretation of cultural connotations and deeper exploration of emotional value[10]. Through human–AI collaboration, traditional cultural symbols can achieve innovative expression and resonance.

6. Conclusion

Artificial intelligence presents new opportunities for the visual design of traditional cultural symbols, playing a significant role in enhancing cultural communication and driving industrial innovation. Through techniques such as image recognition, algorithmic generation, and big data analysis, AI improves both the efficiency and quality of design practices. However, challenges remain, including cultural misinterpretation, high technological costs, and designers' adaptation difficulties. By strengthening AI's cultural learning, optimizing technology to reduce costs, and promoting designer training and cognitive transformation, the integration of AI and traditional cultural symbol visualization can be deepened. With ongoing technological advancement and refinement, AI will better support the inheritance and innovation of traditional culture, enabling it to flourish with renewed vitality in contemporary society.

References

- [1] Pedersen, I. (2023). The rise of generative AI and enculturating AI writing in postsecondary education. Digital Life Institute.
- [2] Li, J., Zhang, C., Zhu, W., & Ren, Y. (2025). A comprehensive review of deep learning models for image generation in creative industries. *Journal of Computer Applications*, 45(1), 23–35.
- [3] Rane, N., Choudhary, S., & Rane, J. (2024). Artificial intelligence and machine learning in business intelligence, finance, and e-commerce: A review. SSRN.
- [4] Ouyang, F., Zheng, L., & Jiao, P. (2022). Artificial intelligence in online higher education: A systematic review of empirical research from 2011 to 2020. *Education and Information Technologies*, 27, 7893–7925.
- [5] Leong, W. Y. (2025c). AI-powered color restoration of faded historical paintings. Proceedings of the 10th International Conference on Digital Arts, Media and Technology and the 8th ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunications Engineering.
- [6] Masiola, M., Lappas, G., & Yannacopoulou, A. (2024). Generative AI in education: Assessing usability, ethical implications, and communication effectiveness. *Societies*, 14(12), 267.
- [7] Vafadar, M., & Amani, A. M. (2024). Academic education in the era of generative artificial intelligence. *Journal of Electronics and Electrical Engineering*, 3(1), 45–56.
- [8] Wang, M. K., & Leong, W. Y. (2025). Implementation of multimodal assessments to address public speaking anxiety among college students. *INTI Journal*, 2025(2), 1–8.
- [9] Yu, H. (2023). Reflection on whether ChatGPT should be banned by academia from the perspective of education and teaching. *Frontiers in Psychology*, 14.
- [10] Zhou, X., & Lee, M. (2024a). Generative AI in creative art: Enhancing artwork value and creative efficiency. *PNAS Nexus*, 1(1), 45–56.