

# Digital Reconstruction for the Ancient Chinese Women's Wedding Attire

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**Abstract:** *Ancient Chinese wedding attire has a history spanning over a thousand years, evolving from the Zhou Dynasty to the Ming Dynasty, and gradually developing into a distinctive ritualized system. According to historical development, it can be broadly categorized into three representative styles: Zhou, Tang, and Ming. Zhou Dynasty wedding attire emphasized solemnity through an all-black color scheme, reflecting the strict ritual norms of the time. During the Tang Dynasty, wedding attire, known as Dianchai Liyi, was characterized by elaborate headdresses and luxurious aesthetics influenced by an open and prosperous society. In the Ming Dynasty, Fengguan Xiapei became the defining form of women's wedding attire and established a model that influenced later generations. As a significant cultural symbol, ancient Chinese wedding attire embodies ritual values, social hierarchy, and aesthetic transformation, exerting long-lasting influence on East Asian wedding customs and global wedding culture. With the continuous excavation of related artifacts, the limitations of traditional research methods in reconstructing wedding attire have become increasingly evident. Therefore, this study integrates textual research, archaeological evidence, and digital technologies, including artificial intelligence, to conduct three-dimensional digital reconstructions of the three major types of ancient Chinese wedding attire, offering new methodological approaches for costume studies and digital cultural heritage preservation.*

**Keywords:** Ancient Chinese Women's Wedding Attire; Historical Evolution; Archaeological Research; Digital Reconstruction

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## 1. Introduction

### 1.1 Research background

Throughout history, the development of wedding attire culture has always been closely related to human social lifestyles and cultural concepts. It is a comprehensive reflection of social systems, etiquette norms, and aesthetic consciousness, and has important social value and cultural significance. The evolution of traditional Chinese women's wedding attire has generally gone through three representative historical stages: The Zhou Dynasty wedding attire period, represented by the pre-Qin period to the Han Dynasty; The Tang Dynasty wedding attire period; and the Ming Dynasty wedding attire system, which gradually took shape and was perfected during the Song and Ming Dynasties. Zhou Dynasty weddings, entered on "rites", established a relatively complete system of wedding ceremonies and attire, profoundly influencing later wedding customs and attire styles. Tang Dynasty weddings, characterized by

social openness, prosperity, and the fusion of diverse cultures, featured richer forms and more ornate attire, reflecting the era's distinctive characteristics. The Song Dynasty society, which upheld orthodox Confucianism and emphasized ritual order and ethical norms, saw wedding attire aesthetics gradually shift towards elegance and simplicity. The phoenix crown was formally incorporated into the official attire system, gradually forming the "phoenix crown and embroidered robe" style of women's wedding attire. Ming Dynasty wedding attire, building upon the Song system, developed and innovated, established a typical women's wedding attire style centered on a bright red auspicious robe, upper and lower garments, and a phoenix crown and embroidered robe, which continued to influence Qing Dynasty and early Republican era wedding styles. Overall, traditional Chinese women's wedding attire exhibits distinct ritual characteristics, aesthetic styles, and cultural symbols across different eras, forming a developmental trajectory that is both continuous and dynamic (Wang, 2016).

## **1.2 Research Gaps and Core Question**

Literature searches in academic databases such as CNKI, Google Scholar, and Web of Science reveal that while academia has produced a wealth of research covering various aspects of ancient Chinese wedding customs, marriage systems, and ritual systems, systematic research specifically focusing on "traditional women's wedding attire" remains relatively scarce. Currently, the number of published monographs on wedding attire is limited, and academic papers on the forms, systems, and aesthetic characteristics of wedding attire are scattered, exhibiting a fragmented research perspective and an insufficient systematization. Particularly noteworthy is that existing research largely concentrates on collating historical document, analyzing art images, or interpreting folkloric elements, with limited in-depth exploration of the structural characteristics, formal logic, and restoration methods of women's wedding attire. Especially against the backdrop of the continuous development of digital humanities and the digitization of cultural heritage, research on using digital technology for 3D modeling and virtual restoration of traditional wedding attire is almost nonexistent, indicating a significant research gap between research on wedding attire culture and digital preservation. Based on this, this study, by systematically reviewing relevant literature and combining archaeological findings of wedding attire with images, introduces AI 3D reconstruction technology to conduct virtual reconstruction research on the three major traditional Chinese women's wedding attire systems in terms of shape and structure, fabric characteristics, color application, and decorative patterns. This aims to address the deficiencies in theoretical research and provide a design basis for traditional wedding attire design.

## **1.3 Research Objectives**

- a) To fill theoretical and practical gaps.
- b) Discovering new approaches to 3D reconstruction of traditional clothing.

## **2. literature review**

### **2.1 Overview of Domestic Research**

In his research, "A Study of Traditional Women's Wedding Attire Based on the Modern Consumer Market," Professor Wang Gefei of Beijing Institute of Fashion Technology points out that while modern women's overall awareness of traditional wedding attire remains low, over 80% of respondents expressed a willingness to consider it, indicating significant potential market demand. However, the current wedding attire market still faces structural problems such as a limited number of traditional wedding attire shops, a lack of diverse styles, a shortage of mid-range products, and the long-standing dominance of Western-style wedding dresses (Wang & Lin, 2015). Therefore, promoting systematic research, design innovation, and

development and application of traditional wedding attire from both theoretical and industrial perspectives is clearly necessary.

A systematic search of academic databases, including CNKI, Wanfang, Du Xiu, and other relevant sources in Chinese-speaking regions, reveals that the research on ancient Chinese marriage mainly focuses on macro-level aspects such as marriage customs, marriage systems, and women's marriage and family life. Systematic research centered on "ancient women's wedding attire" is extremely limited, exhibiting a general lack of research and scattered literature. Among existing works, Wang Gefei's *Ancient Marriage and Women's Wedding Attire* is the only domestic research work specifically focusing on ancient women's wedding attire. This book uses historical dynasties as a timeline to analyze and discuss marriage systems and women's wedding attire (Wang, 2016). However, regarding the structure, form, patterns, and institutional details of wedding attire in specific dynasties, it relies primarily on textual descriptions, lacking supporting visual materials or archaeological evidence, and has not yet constructed a complete and systematic framework for clothing research. Besides this monograph, related content is often found in comprehensive books on clothing, such as *Symbolic China: Ancient Costume* by the Editorial Team of Symbolic China. (Editorial Team of Symbolic China, 2024). *Impressions of China: A Paper Museum: Clothing* by Shen Zhou, (Shen, 2016). *The Wardrobe of History: Selected Works of Ancient Chinese Clothing* by Gu Fanying, (Gu, 2018). and *Their Tang Dynasty Trend* by Jing Ni (Ni, 2024). These works typically present images of wedding attire from the Zhou, Tang, Song, and Ming dynasties in a juxtaposition of text and images, but they are generally limited to a general introduction of basic forms or color characteristics, lacking systematic analysis. At the academic paper level, current research published in higher-ranking journals primarily focuses on the Tang, Song, and Ming dynasties. Liang Yan's related work, published in the *Journal of Textile Research*, presents reconstructions of official wedding attire from the Song and Ming dynasties, showcasing the general appearance of the garments (Liang et al., 2025) (Liang et al., 2024). However, it does not provide in-depth explanations of the patterns, materials, and structural details of the wedding attire, and the related findings have not yet formed a complete research system in the form of a comprehensive academic paper. In the *Journal of Silk*, Fang Lingyun examined the origins of the "preference for blue" phenomenon in traditional women's wedding attire, but her research primarily focused on the concept of the color and did not cover aspects such as the overall design of the wedding dress, the main and secondary colors used, materials and craftsmanship, or decorations (Fang et al., 2023). Although Hou Wenxue's research primarily focuses on the marriage attire system of men in the Zhou Dynasty, his findings offer valuable insights into understanding gender differences and institutional connections within the broader marriage attire system (Hou, 2010). Su Wenhao conducted a reconstructive study of commoners' wedding attire in the Ming Dynasty from the perspective of socio-cultural and marital traditions, but his classification and presentation of the styles remain relatively brief, and his research findings do not include a direct and concrete restoration of the wedding attire's appearance (Su & Zhang, 2025). Fan Yingze takes the patterns and accessories of women's wedding attire in the Song dynasty as the point of departure for her study, exploring their cultural connotations; however, the research remains relatively limited in scope and does not yet incorporate a comprehensive, multi-factor analysis. (Fan, 2025, P.98-102). In the dissertation, Zheng Yuqin (2020) employed a comparative analysis of visual and textual sources to examine the styles of women's wedding attire in the Tang Dynasty; however, issues related to methodological standardization and digital visualization remain to be addressed.

In summary, domestic academic research on women's wedding attire generally remains a secondary topic within the history of marriage customs or clothing, lacking systematic, cross-

dynastic studies centered on the “women’s wedding attire system.” Regarding the presentation of research materials, there are widespread problems, including a scarcity of visual materials, insufficient archaeological evidence, and inadequate structural analysis. In terms of research content, key elements such as the form and structure of wedding attire, color systems, fabric techniques, and the semantic meaning of patterns have not yet yielded multi-dimensional and systematic research results. In reconstruction research, the application of digital technology remains relatively limited, and new approaches are yet to be explored. These shortcomings present important research opportunities for developing a systematic research framework for ancient women’s wedding attire and creating digital reconstruction methods.

## 2.2 Overview of international research

In international research, relevant findings are primarily presented in the form of academic papers. A search of English academic databases such as Web of Science and Google Scholar reveals that there is currently no dedicated research on the digital reconstruction of ancient Chinese wedding attire; however, the use of digital technology for the research and reconstruction of traditional clothing is gradually increasing. Early research largely relied on historical verification methods. Fe Santoveña Zapatero, through extensive literature, newspapers, and photographic materials, systematically analyzed the formation of traditional clothing among Asturian immigrants in the United States between 1880 and 1900, demonstrating the significant value of visual historical materials in clothing research (Santoveña Zapatero, 2016). With the development of digital technology, more and more scholars are beginning to use CAD, 3D modeling and other technologies to more accurately and intuitively restore and display traditional clothing. Based on historical research, Yanzhen Liu and Beibei Zhang combined CAD pattern making and 3D modeling to digitally reconstruct women’s clothing in the Jiangnan region during the Yuan Dynasty. However, due to the limitations of the technology at the time, the overall simulation effect is still insufficient (Liu & Zhang, 2022). The research team led by Kaixuan Liu has published numerous achievements in the field of digital restoration of traditional Chinese costumes. Their research approach is largely based on historical analysis, combining the deconstruction of costume elements, 2D pattern making, and CLO3D restoration, covering multiple directions such as painted costumes, opera costumes, and regional traditional costumes. While their research excels in the quantity and information density of restored costumes, their methodological system is relatively singular (Liu et al., 2023a, 2022, 2023b). Based on this, Xiaotian Wang (Wang et al., 2024) constructed the proportional relationship between figures and clothing through image measurement and introduced the FAHP evaluation system after virtual restoration to verify the accuracy of the restoration results. The overall method is relatively complete, but there are still shortcomings in the analysis of clothing patterns, colors and materials. In comparison, the research on Ming Dynasty Hwarang costumes by Chun Zhu et al. and the digital restoration of traditional Huizhou costumes by Bing Hu et al. have further integrated multiple technologies such as CAD, CLO3D, 3DMAX and texture scanning, and gradually formed a more systematic digital restoration path (Zhu et al., 2025) (Hu & Wang, 2025).

A review of research by Ding et al. (Ding & Liang, 2024) reveals three key points: First, the interdisciplinary integration of digital technology with traditional disciplines such as archaeology, history, and costume design has become a significant trend in this field. Second, the research focus of digital restoration is expanding from the appearance of clothing to multiple layers, including texture, pattern, color, fabric, makeup, and hairstyle. Third, in the field of digital cultural heritage preservation, the integrated application of 3D scanning, virtual try-on, and AI-assisted technologies is gaining increasing attention. However, compared to the first two points, the practical application of AI-assisted technology in the digital restoration of

clothing remains significantly insufficient. Although some scholars have theoretically explored the potential value of AI in the preservation, restoration, and innovative design of traditional clothing, related research largely remains at the framework construction level, lacking concrete empirical evidence and methodological verification. Therefore, how to effectively introduce AI technology into the study of ancient women's wedding attire and construct a more systematic and scientific digital restoration and display path remains an important research direction that urgently needs in-depth exploration (Ding & Liang, 2024) (Wu & Lin, 2025).

### 3. Methodology

#### 3.1 Styles and designs of wedding attire in the Zhou Dynasty

The ritual system of Zhou Dynasty society had matured, and weddings, as an important component of this system, embodied the Zhou people's high regard for the continuation of clan lineage and the construction of social order. Before the Han Dynasty, wedding systems largely followed the Zhou system, with strict and complete norms and procedures governing marriage. This not only established the legitimacy of marital relationships but also maintained the stability and continuity of the patriarchal system at the institutional level. As a major ritual activity at the family level, weddings were related to the rise and fall of the clan and the inheritance of social status. Therefore, the sacredness and symbolic meaning of Zhou Dynasty weddings had a profound influence on later marriage customs and clothing systems.

In terms of clothing style, Zhou Dynasty wedding attire mainly consisted of wide robes and long garments, with the typical style being the "shenyi". The structural feature of the shenyi was that the upper garment and lower garment were cut separately and then sewn together at the waist, symbolizing the exclusivity and unity of the marital relationship. Structurally, the garment was divided by a clear waistline, forming a two-part structure of "upper garment and lower garment," with the clear mid-waist seam being the most representative structural feature of the shenyi. When worn, the garments were wrapped around the body, creating a layered effect that reflected the solemnity and order of ceremonial attire. In terms of overall design, Zhou Dynasty wedding robes often had a T-shaped silhouette, with wide sleeves and straight, flowing shoulder and sleeve lines, resulting in a dignified, elegant, and solemn appearance. The collars were mostly cross-over, and the garments were fastened without buttons, relying on waist ties for security. Thick trim was often used at the collar, cuffs, and hem to enhance the solemnity of the ceremonial attire. The *Xin Ding San Li Tu* as an important document reflecting the ceremonial attire of the Zhou Dynasty, systematically presents the image of aristocratic women's formal wear. This article, based on relevant images from the *Xin Ding San Li Tu*, summarizes the stylistic characteristics of Zhou Dynasty wedding robes and creates schematic diagrams of these styles (Nie, 2022, p3), Figure 1.

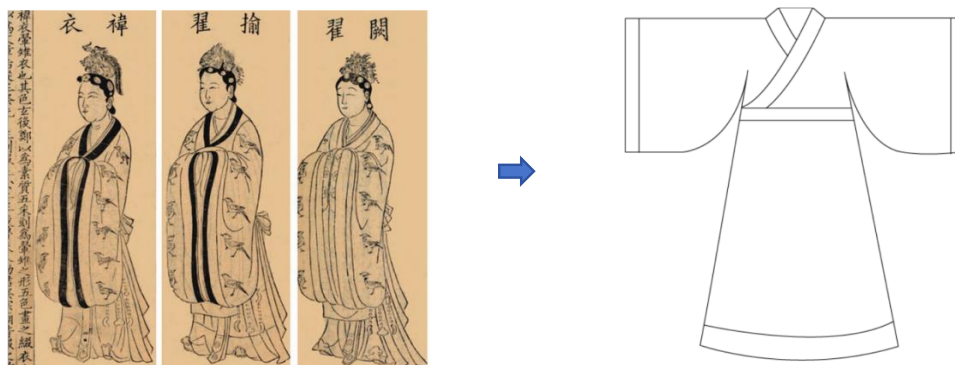


Figure 1: Nie's work, *Illustration of Queen's Formal dress*, Illustrations of women's wedding 962 CE, in *Xin Ding Sanli Tu* (2022,p. 3)

### 3.2 Colors and Fabrics of Wedding Attire in the Zhou Dynasty

The wedding attire of women in the Zhou Dynasty exhibited a distinct and stable institutional characteristic in terms of color. The overall color scheme was predominantly black, with red trim along the collar, sleeves, and hem, creating a solemn visual effect. This “black background with red trim” color scheme reflected both the cosmological concept of “harmony between heaven and earth” and the Zhou Dynasty’s aesthetic and hierarchical consciousness of “black as the epitome of honor.” In terms of fabric selection, Zhou Dynasty wedding attire strictly adhered to the social hierarchy. Noblewomen’s wedding attire primarily used silk fabrics to highlight their social status and ceremonial identity; while commoner women mainly used plant fiber fabrics, resulting in relatively simple materials. Notably, Zhou Dynasty wedding attire was devoid of decorative patterns, emphasizing the ceremonial attributes of the colors and materials themselves, presenting a serene and understated aesthetic. This black and red-dominated, undecorated color system for wedding attire, established in the Zhou Dynasty, long influenced the ancient Chinese wedding attire system and continued until the Tang Dynasties, becoming an important model for early wedding clothing, Figure 2.

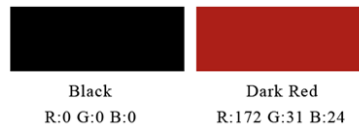


Figure 2: Color scheme of women’s wedding dress in the Zhou Dynasty

### 3.3 Accessories for wedding attire in the Zhou Dynasty

The accessories system for wedding attire in the Zhou Dynasty was relatively fixed, mainly including the *Bixi* (蔽膝) a ritual accessory suspended from the waist in Zhou dynasty ceremonial attire, wide belt, jade, and shoes. The overall color scheme often coordinated with the color of the wedding dress, or was uniformly black, to emphasize the ceremonial attributes and symbolic meaning of the wedding attire in the wedding ceremony. The wide belt, a common waist ornament in ancient formal attire, was usually made of silk, cut into a long, narrow strip, and tied outside the garment. Its function was not practical restraint, but rather focused on decoration and ceremonial expression, highlighting the layered structure of the clothing and the wearer’s status. The knee-covering, hanging in front of the garment, was an accessory with clear ceremonial meaning in Zhou Dynasty formal attire, symbolizing the wearer’s social rank and ceremonial status, exhibiting distinct institutional characteristics. Furthermore, the jade, as an important personal ornament, not only reflected the Zhou Dynasty’s social value of “comparing jade to virtue,” but also carried the dual meaning of moral norms and status symbols in wedding occasions. Shoes, as part of the overall wedding attire, also followed ceremonial norms in shape and color, maintaining unity with the overall style of the clothing, together forming the solemn and dignified ceremonial image of Zhou Dynasty women’s wedding attire, Figure 3.



Figure 3: Bixi (蔽膝) Jade accessories at the waist

### 3.4 AI Reconstruction Simulation Experiment

This study introduces artificial intelligence technology to conduct a digital restoration experiment of ancient clothing. Based on documentary records, archaeological artifacts, and research results on clothing systems, the study visualizes and reconstructs the clothing style, color, and accessories, Figure 4.



Figure 4: AI Reconstruction for the Zhou Dynasty Wedding attire

### 3.5 Styles and designs of wedding attire in the Tang Dynasty

The Tang Dynasty was one of the most prosperous periods in the development of feudal society in China, characterized by economic prosperity, social stability, a relatively sound political system, and remarkable achievements in national governance. Against this historical backdrop, Tang society exhibited a relatively open character, which was reflected not only in its political system and ethnic policies but also profoundly influenced the development of folk culture and marriage systems, with wedding attire being a significant manifestation. The Tang Dynasty's wedding attire system originated from the empress's ceremonial robes, gradually forming the style of wedding attire commonly worn by the aristocratic class. The empress's ceremonial robes of the Tang Dynasty mainly included three types: the Hui Yi (袿衣), the Ju Yi (鞠衣), and the Dianchai Liyi (钿钗礼衣). Among these, the Dianchai Liyi was the most widely used. Historical records indicate that the Dianchai Liyi worn by court ladies was not significantly different from other ceremonial robes in terms of form and system, and this style was not strictly limited to the upper class; over time, it gradually spread to lower social classes, and commoners could also wear it for their daughters' weddings. Therefore, the Dianchai Liyi ultimately became the most commonly adopted wedding attire style in Tang Dynasty society. In terms of style, the Dianchai ceremonial robe evolved from the Huachai daxiu ruqun (a type of long-sleeved blouse and skirt). Its basic structure consists of a wide-sleeved robe and a long skirt, complemented by a shawl, resulting in a complex overall layered effect. Despite the

numerous layers, the visual effect remains both ornate and orderly. According to historical records, when formally worn, the Dianchai ceremonial robe typically required an outer, wide-sleeved garment over a ruqun, adorned with hairpins and other jewelry. The overall combination of attire is dignified and beautiful, fully reflecting the ceremonial and aesthetic characteristics of Tang Dynasty wedding attire, Figure 5.



Figure 5: Note. From *Line of female donors*, Late Tang dynasty (c. 835–907 CE), Unsplash([http://kaogu.cssn.cn/zwb/kgyd/kgbk/201503/t20150305\\_3932692.shtml](http://kaogu.cssn.cn/zwb/kgyd/kgbk/201503/t20150305_3932692.shtml)) Unsplash licence.

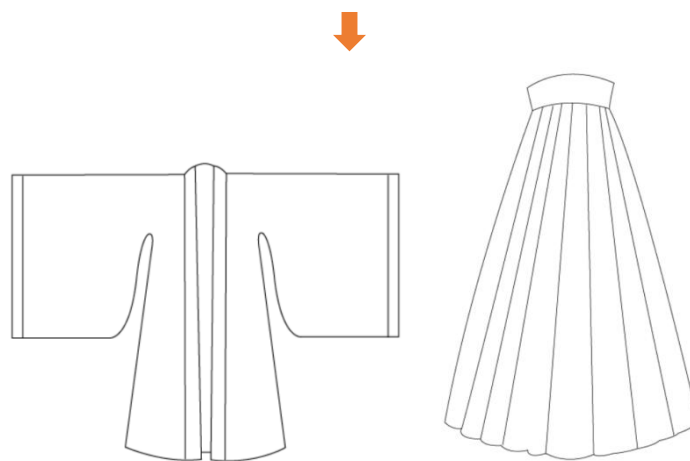


Figure 5: Illustrations of women's wedding attire in Tang Dynasty

### 3.6 Colors, patterns, and fabrics of Tang Dynasty wedding attire

In the Tang Dynasty, wedding attire primarily featured blue as the main color, as blue held auspicious connotations in ancient times. The collar, sleeves, and hem of the formal wedding dress were adorned with red ribbons and embroidered patterns, and a plain gauze undergarment was worn beneath. The patterns on the clothing depicted pheasants, a type of bird motif. The arrangement and number of these patterns varied according to social rank, with the highest-ranking wedding attire featuring nine rows of patterns, and other ranks having eight, seven, or six rows respectively, Figure 6, Figure 7.

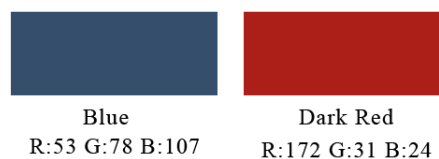


Figure 6: Color scheme of women's wedding dress in the Tang Dynasty



**Fig7: Note.** From *Seated Portrait of Song Renzong’s Empress, (960–1279)*, Unsplash (<http://digitalarchive.npm.gov.tw/Collection/Detail/1866?dep=P>) Unsplash licence.

### 3.7 Accessories and hair ornaments for Tang Dynasty wedding attire

The main accessories for Tang Dynasty wedding attire included *Bixi* (蔽膝), wide belts, white jade pendants, leather shoes, and socks, with blue as the primary color for both.

### 3.8 AI Reconstruction Simulation Experiment



**Figure 8: AI Reconstruction for the Tang Dtnasty Wedding attire**

### 3.9 Styles and designs of wedding attire in the Ming Dynasty

The Ming Dynasty was a significant peak period in the development of traditional Chinese wedding attire. Building upon the wedding attire systems of the Tang and Song Dynasties, its style gradually developed into one characterized by composure and dignity. This laid the institutional and aesthetic foundation for the basic form of women’s wedding attire for the next several centuries, which primarily consisted of a bright red auspicious robe, a two-piece upper garment and lower skirt, and a phoenix coronet and embroidered shawl. In the Ming Dynasty wedding attire system, the bright red wide-sleeved robe paired with an embroidered shawl (a ceremonial decoration) was the exclusive formal dress for aristocratic women. The Ming Dynasty’s formal dress system was clearly hierarchical, with strict regulations governing the

use of clothing by different social classes; commoner women were not permitted to wear such formal dresses. The wide-sleeved robe's structural features are quite distinct: it has a straight collar, a front opening, and an additional sewn collar; there are no buttons or ties at the front; both sides are slit from the armpits to the hem; the length extends past the knees; the back piece is slightly longer than the front piece, and two buttons are placed on each side of the back hem to fold and secure the excess back piece when walking, ensuring a consistent front and back length for ease of movement. For details on the specific form of the wide-sleeved robe during this period, please refer to the images of plain satin wide-sleeved robes unearthed in archaeological excavations, Figure 9. In terms of matching, wide-sleeved shirts were often worn with horse-face skirts. Noblewomen often embroidered patterns on solid-colored horse-face skirts to enhance the gorgeousness and status symbol of the clothing, reflecting the dual characteristics of Ming Dynasty wedding attire in terms of etiquette and aesthetics.



Figure 9: Note. From *Plain silk wide-sleeved robe, The Ming Dynasty (1368–1644)*, Unsplash(<http://user.guancha.cn/main/content?id=207178>)

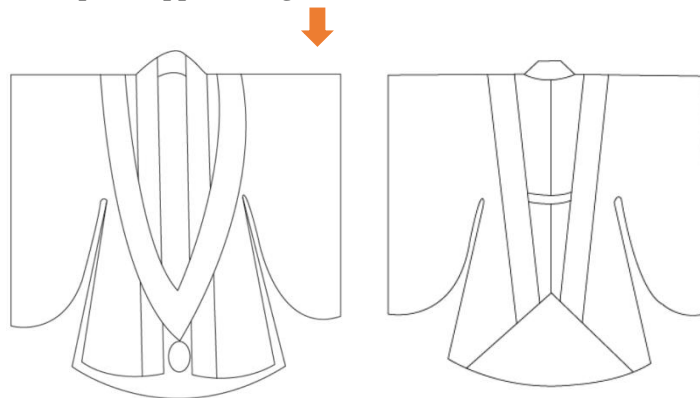


Figure 9: Front and back view of the long-sleeved shirt

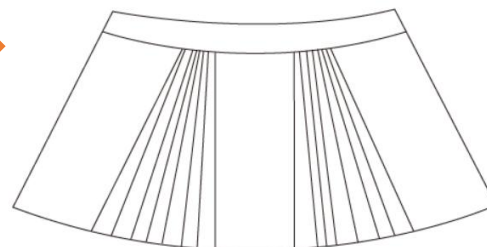


Figure 9: Note. From *Ming Dynasty light green silk skirt with woven gold thread and embroidered floral patterns, (1368–1644)*, Unsplash(<http://www.kzbgwg.cn>)

#### 4. Colors, patterns, and fabrics of Ming Dynasty wedding attire

The wedding attire colors of the Ming Dynasty inherited the style of the Song Dynasty, using red, specifically vermilion red, and the *Xiapei* (霞帔), a type of clothing accessory is all dark blue. In terms of fabric, the wide-sleeved robe was a loose, single-layered garment, and fabrics with a good sheen were used to showcase the quality of the clothing. Therefore, for wedding attire, the wide-sleeved robe was generally made of plain satin, paired with a dark blue embroidered *Xiapei*. The wide-sleeved robe itself had no patterns; the patterns were mainly concentrated on the *Xiapei* and the skirt. The patterns on the *Xiapei* were diverse, including cloud and phoenix patterns, pheasant patterns, peacock patterns, mandarin duck patterns and intertwined floral patterns. Cloud and phoenix patterns and pheasant patterns were generally used by imperial consorts, peacock patterns were generally used by nobles of a certain rank, and ordinary people generally used mandarin ducks to symbolize wealth and longevity, Figure 10.

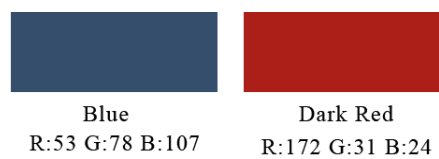


Figure 10: Color scheme of women's wedding dress in the Ming Dynasty



Figure 10: This AI restoration based on the patterns found on the *Xiapei* unearthed from the tomb of Prince Mingyi Xuan and his wife in Nancheng, Jiangxi Province, dating back to the Ming Dynasty.

##### 4.1 Accessories and hair ornaments for Ming Dynasty wedding attire

Compared to the openness and diversity of wedding attire and accessories during the Tang and Song dynasties, Ming dynasty wedding attire, while inheriting the systems of previous dynasties, further reinforced ritual norms and hierarchical order. Ming dynasty wedding attire accessories primarily included headwear and embroidered scarves *Xiapei*. The use of headwear had clear distinctions based on social status. The phoenix crown, as a symbolic ceremonial headdress for imperial women, was limited to princesses and women of higher rank in the imperial court for important ceremonies such as weddings; women of lower ranks, such as those of the outer court, typically wore floral hairpins as their wedding headwear. During the Song and Ming dynasties, the *Xiapei* was a significant accessory for wedding attire, continuing and developing into a mature form. The *Xiapei* was usually made of two long, narrow silk fabrics, adorned with patterns. When worn, it was draped from the back of the neck over the shoulders, hanging down the front of the chest, with pendants attached to the ends. The combination of the *Xiapei* and the wedding dress not only reinforced the ceremonial attributes of the clothing but also contributed to a dignified, luxurious, elegant, and solemn aesthetic, becoming a highly representative decorative element in the Ming dynasty wedding attire system, Figure 11.



Figure 11: Song Dynasty (960–1279) Portrait of Empress Dowager Song Xuanzu. Design draft for Xiapei

#### 4.2 AI Reconstruction Simulation Experiment



Figure 12: AI Reconstruction Simulation Experiment

### 5. Discussion and Implications

#### 5.1 Advantages and limitations of existing digital reconstruction methods

Currently, research on digital reconstruction in the field of clothing can be broadly divided into two categories: one focusing on fashion or specific garments, and the other centered on traditional or historical clothing. This classification not only reflects differences in research objects but also creates distinct differences in methods, objectives, and evaluation criteria. Related research typically covers multiple aspects, including human body modeling, garment structure analysis, pattern and color design, fabric simulation, and digital system evaluation,

and often relies on virtual clothing platforms such as CAD, CLO3D, and Style3D for 3D modeling and virtual try-on. This technological approach emphasizes the combination of engineering logic and visual representation, and has formed a relatively stable methodological system in clothing research. This method, centered on clothing engineering logic, combines structural deduction and visual restoration, gradually forming a relatively mature and verifiable technical route in digital cultural heritage research. However, this method heavily relies on the researcher's professional experience and manual operation, making the reconstruction process relatively complex and time-consuming. When the research involves multiple garment styles or requires comparative analysis of different designs, its efficiency and scalability are significantly limited. This limitation, to some extent, restricts its application in large-scale or exploratory research.

## **5.2 Advantages, limitations, and implications of AI-assisted garment reconstruction methods**

Unlike the aforementioned research approaches primarily based on manual modeling, this paper introduces an artificial intelligence-based image feature learning method to explore a digital garment reconstruction path guided by visual generation and efficiency improvement. This method is trained entirely on garment reconstruction samples drawn by researchers based on literature review and image analysis. Therefore, the model's generated results are not a direct re-learning of the original historical images, but rather a visual extrapolation and extension of existing academic reconstruction schemes. From a methodological perspective, this process is closer to a visual verification of research hypotheses than a replication of historical artifacts. In the experimental process, the most significant advantage of this method is the substantial reduction in reconstruction time and its ability to present the overall visual effect of historical figures and clothing relatively completely. It demonstrates high visual realism, especially in the generation of accessories and decorative elements, which helps in quickly establishing the overall image of the clothing and its historical context. However, this method still has significant shortcomings in restoring garment structural details and material physical properties, making it difficult to meet the archaeological-level restoration requirements that prioritize structural accuracy. Therefore, image feature learning-based reconstruction is more suitable as an exploratory and auxiliary research tool for scheme comparison, visual verification, and cultural dissemination, rather than replacing traditional rigorous garment engineering modeling methods. Future research can further improve its reliability in terms of structure and texture by introducing higher-precision deep learning models and combining them with physical simulation techniques.

## **6. Limitations**

This study still has certain limitations. Firstly, reconstruction methods based on image feature learning are currently unable to achieve engineering-grade or archaeological-grade accuracy in terms of garment structural details and material physical properties. Therefore, they are more suitable for visual verification and comparison of overall designs rather than rigorous garment engineering modeling. Secondly, the reconstruction results depend to some extent on the academic interpretations and research assumptions contained in the training samples. This dependence may affect the objectivity and consistency of the visual presentation. Given these limitations, this method should be considered a supplementary tool to traditional methods of costume research. Future research could combine AI-based reconstruction with traditional documentary evidence and structural analysis methods, and introduce higher-precision deep learning models and physical simulation techniques to further enhance the academic value of digital restoration of traditional costumes.

## 7. Conclusion

This study, based on archaeological analysis and image processing, utilizes AI-assisted restoration techniques to reconstruct the styles, colors, fabrics, and patterns of the three major forms of ancient Chinese wedding attire. This method fills a significant gap in the study of historical wedding garments and explores a new digital restoration approach. By introducing AI technology, this method enables large-scale restoration of traditional clothing, effectively overcoming the limitations of traditional restoration methods, which are often complex and inefficient. Compared to traditional methods, AI-assisted restoration presents a more realistic effect through environmental simulation. These research results indicate that introducing AI technology into future research on traditional clothing restoration has significant potential, helping to improve the authenticity and efficiency of the restoration process.

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## Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

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