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Innovation Construction of the Intelligent Pedigree of Chinese Traditional Silk Design Aided by Artificial Intelligence

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ABSTRACT: In the context of innovation construction, the current paper examines the critical contribution made by artificial intelligence (AI) towards the preservation and innovation of the traditional Chinese silk design. It examines how the technologies of pattern recognition, machine learning, and digital archiving streamline the analysis, reproduction, and creative interpretive process of these complex designs. The study realises the cultural, historical, and symbolic value of the patterns draped over Chinese silk. The study confirms a strong positive relationship between AI and the evolution of the intelligent line of silk design development, indicating the potential of AI for utilising cultural heritage safeguarding functions while generating innovation for the modern era. Using a quantitative research approach, including the analysis of surveys and factor analysis, the study shows how AI not only contributes towards facilitating the preservation and documentation of ancient theme-based designs but also helps generate innovative designs appreciated by contemporary customers. This research highlights AI's capabilities for supporting the development of a sustainable future, cultural continuity preservation, and global promotion of Chinese silk artistry by integrating traditional artisanship with modern digital technology. Finally, the study highlights the critical contribution of AI towards the preservation of cultural legacy as well as towards becoming a catalyst for creative development for the Chinese silk design. The study shows that AI protects China's silk history and encourages creative innovation, making Chinese silk art more globally accepted and sustainable. This study shows how AI keeps Chinese silk themes alive, dynamic, and influential in fashion, home design, and academia.

1. INTRODUCTION

Stitching, a kind of decorative stitching, is an integral part of many people's daily lives, as is well known. Works of art created by meticulous embroidery are indisputable cultural treasures. Research into and implementation of these technologies in the stitching process have followed recent advances in artificial intelligence (AI) and robots. This study's overarching goal is to catalogue all the ways in which these technological advancements facilitate sewing. Throughout the years, tales, museum collections, and written records have been among the most common means of preserving the lineage of silk designs. These approaches may not be user-friendly or flexible enough to meet the demands of current digital technologies, notwithstanding their usefulness. Intelligent genealogy datasets use adaptive algorithms and interactive technology to catalogue, monitor, and improve traditional silk designs (Wenji et al., 2022). One may find digital representations of these designs in their archives. Cultural heritage studies, digital humanities, textile design, and AI specialists conducted an extensive survey. One goal of the study was to find out what people think about the current state of AI pattern creation for clothing. The evaluation of AI classification systems' merits and shortcomings was another aim. The study also enquired as to whether respondents believed

that innovative ideas would mitigate some of the drawbacks of AI. This provides the foundation for the organised recovery, interpretation, and application of patterns that exist both inside and outside of their original cultural environments. This AI-powered approach has the potential to lead to the development of whole modern technologies, in addition to just preserving historical relics. As a result of the use of design approaches that are based on dataset, digital artists, textile engineers, and garment designers can contribute to this process by reassessing conventional notions (Zhang & Gao, 2025).

2.BACKGROUND OF THE STUDY

Ancient Chinese silk sculptures are among the finest examples of textile art. No other textile designs are as beautiful and historically significant as these. These stunning designs have historical, symbolic, and religious connotations. Roots in ruler history give it prominence. China's use of silk for ceremonial apparel and regal robes preserved Confucianism, Taoism, and Buddhism's aesthetics. It represents numerous things, including dynasties, social classes, and regions. The influences of industrialisation, urbanisation, and the increasing use of digital technology in the contemporary period are making it more difficult to retain the intricate patterns that carry cultural history. This area of AI is still in its initial stages, and very few studies have focused on textile design, much less Chinese silk designs. Despite widespread recognition of Chinese silk's historical significance, digital technology has fallen behind methods used to restore, reproduce, and build upon traditional themes. To meet this need and guarantee the ongoing success of conventional silk design processes, researchers have looked to innovative technological alternatives, namely AI. Medicine, business, schools, factories, and, increasingly, the media and entertainment industry are just a few of the many areas already affected by AI's widespread use. AI is already having an impact on a number of these domains. There are many present-day uses for AI, including image identification, cultural asset protection, and the production of original works of art. This class includes techniques such as deep neural networks, machine learning, and GANs. Technological advancements have made it possible for textile designers to automate hitherto manual tasks such as sketching out ideas, evaluating massive volumes of visual dataset, and extracting aesthetic components. Furthermore, the likelihood of all these things occurring is not out of the ordinary. There is hope that AI's pattern-recognition skills will allow for the refinement and preservation of ancient silk designs for future generations. The exceptional ability to recognise and gather patterns automatically is the reason for this. It is critical to strike a balance between preserving and innovating to make sure that historical designs are still applicable to contemporary fashion, interior design, and academic research (Mazur-Włodarczyk, 2024).

3.PURPOSE OF THE RESEARCH

Innovative ideas can be more easily generated with the help of AI. "The Creation of the Intelligent Pedigree of Chinese Traditional silk design" studied how contemporary AI technology may be used to observe, analyse, and enhance the detailed and beautiful traditional silk designs of China. The ancient silk designs that displayed China's creative and cultural riches were one of the country's distinguishing features. Even though the world was transforming and technology was advancing quickly, it was still compulsory to preserve and expand these priceless artefacts. An "intelligent pedigree"—a comprehensive and structured record of the origins, evolution, and symbolic significance of traditional silk designs—will be created using AI in this project. The research employs AI methods such as deep learning, image recognition, and data analysis to accurately categorise and rank intricate silk designs, detect recurring themes and patterns, and trace their evolution. Because of this, historical practices were still popular among contemporary consumers, thanks to the motivation of innovative designs that help keep them relevant. Technology driven by AI has also facilitated collaboration among cultural organisations, artists, and manufacturers; this augurs well for the conservation of silk weaving as a traditional skill. The preparatory goal is to design a system that is stylish and long-lasting, preserving artefacts from the past while encouraging the development of current ideas. Using this method in the modern digital era would breathe new life into ancient Chinese silk designs. This subject highlights the significance of preserving both contemporary technology and historical heritage. In China's silk industry, this promotes cultural variety while also encouraging creative innovation.

4.LITERATURE REVIEW

AI has shown enormous potential in several domains, including the analysis and production of dataset pertaining to visual, symbolic, and artistic features. There is a lot of energy in these entries. In more than one way, AI may help the fashion and textile industries. Some examples of work in these areas include designing patterns, creating virtual garments to simulate real ones, and tailoring user experiences. To generate fresh designs from existing datasets, uncover previously unseen patterns in datasets, and classify visual themes, machine learning algorithms may execute additional operations. It is possible to create modern designs by using these methods. When it comes to imaginatively recombining prior themes, GANs really shine due to

their ability to produce new pictures while maintaining the visual integrity of the training data. Everybody has a fantastic choice for new interpretations of classic concepts due to their adaptability. Therefore, everybody is the most suitable technical option for this task. Patterns may have been further organised by AI according to their symbolic importance, historical background, geographical position, and aesthetic appeal. This scientific knowledge has the potential to pave the way for the development of an "intelligent pedigree" of traditional silk designs. All the necessary components have been assembled to establish an adaptable digital library capable of storing information for the future as well as incorporating innovative ideas (Yang et al., 2021).

Innovation in all domains is also essential to the current investigation. The creation of entirely new genres or the updating of existing genres in a manner that honours their roots while also embracing modernity are just two examples of how one could approach traditional arts in a creative way. The same procedure works for everyone. Finding a means to merge tradition with change is essential if legacy is to remain dynamic and adaptable instead of rigid and unchanging. It may be necessary to find a compromise between the two to accomplish this. To put a number on innovation, researchers employ a variety of metrics. Cultural sensitivity, realism, adaptability, and creativity are a few of the most important requirements. Integrating AI into creative techniques has further complicated questions of authenticity, originality, and the very basis of design (Liu & Zhou, 2022). Others argue that AI is lacking in the cultural understanding enjoyed by human designers, becoming overly tied to the context of problem-solving. Advocates for AI, however, argue that it provides a gateway into resources previously deemed out of reach, opening new avenues of exploration and research that may allow us all to reach the greatest creative potential. As such, AI comes more into book literature as a complementary partner for the community of designers, instead of a threat to the creative possibilities of humans (Zhang et al., 2025).

5.RESEARCH QUESTION

- How does the AI influence the intelligent pedigree of Chinese traditional silk designs considering innovation construction?

6.RESEARCH METHODOLOGY

6.1 Research Design

To find the underlying cause of things, this study used quantitative research methods. Statistical analysis was carried out by the researchers using SPSS version 25. The demographic data was made more understandable by using descriptive statistics. Analysing odds ratios (OR) using a 95% confidence interval (CI) enables the investigator to evaluate the intensity and direction of the connections. A p-value below 0.05 was used to ascertain statistical significance. Because quantitative methods can undertake thorough statistical analysis and systematic evaluations of survey data, everyone is gaining popularity.

6.2 Sampling

The researchers used a simple random sampling approach to ensure the sample adequately portrayed the features of the research population. After calculations conducted through Rao-soft, a total of 587 individuals were included in the study. A total of 780 questionnaires were sent out to the research subjects. A total of 673 questionnaire forms were returned, but 24 were excluded due to incompleteness of the information, thus a conclusive sample size of 649. The data thus collected from the surveys were analysed through the Statistics for the Social Sciences (SPSS) version 25.0.

6.3 Data and Measurement

Questionnaires were the primary means of collecting data for the research. Part of the survey asked for basic demographics, while part of it used a 5-point Likert scale to ask about issues related to traditional and digital media. A variety of print and digital sources provided the bulk of the secondary data.

6.4 Statistical Software

For the statistical study, the researchers used SPSS 25 in conjunction with MS-Excel.

6.5 Statistical Tools

The data was thoroughly analysed using a description-based technique. For reliability evaluations, factor analysis is the way to go.

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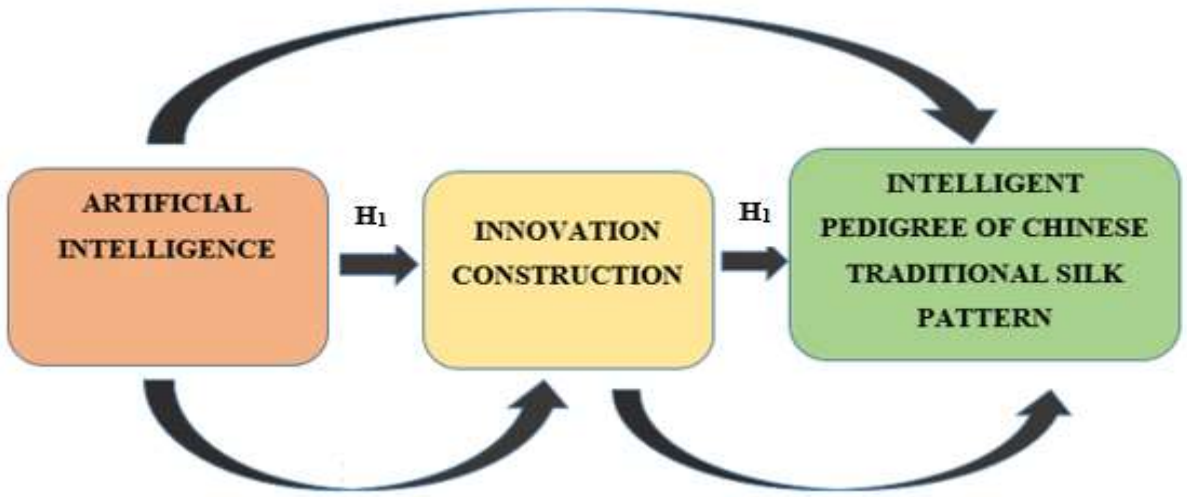
7. CONCEPTUAL FRAMEWORK



8.RESULT

- Factor Analysis

Factor Analysis (FA) is a popular tool for discovering hidden variables in visible data. One typical approach is to use regression coefficients to derive ratings in cases when no clear visual or diagnostic indicators are available. Financial analysts rely heavily on models. The purpose of modelling is to identify mistakes, intrusions, and visible connections. It is possible to use the Kaiser-Meyer-Olkin (KMO) test on datasets that have been produced via numerous regression analyses. By doing so, everybody guarantee that the model is representative and that the sample variables are correct.

The stats show that there is data duplication, which is obvious to everyone. Data is made clearer by reducing proportions. A number between 0 and 1 is the output of the KMO algorithm. A sufficiently big sample is available to all individuals when the KMO value falls between 0.8 and 1. Kaiser specifies the allowable limits: Kaiser has set the following entrance requirements:

Compared to the typical range of 0.60 to 0.69, this falls pitifully short at 0.050 to 0.059.

The usual range for middle grades is between 0.70 and 0.79.

Ranging from an 80 to an 89 on the quality point scale.

Everyone is astounded by values between 0.90 and 1.00.

Table 1: Evaluation of the Adequacy of Bartlett's Sampling and KMO:

The results of Bartlett's sphericity test are shown below: Chi-square test with 190 degrees of freedom and a significance threshold of 0.000. This substantiates the correctness of the arguments about sampling. The researchers used Bartlett's Test of Sphericity to ascertain the relevance of the correlation matrices.

The Kaiser-Meyer-Olkin measure indicates that a result of 0.982 signifies a valid sample.

The p-value obtained from Bartlett's sphericity test is 0.00. If Bartlett's sphericity test yields a significant result, the researcher may conclude that the correlation matrix is not an identity matrix.

Degrees of freedom (df): 190; approximate Chi-square value: 7315.249; Sig. .000

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Table 1: KMO and Bartlett's Test

KMO and Bartlett's Test[a]		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.982
Bartlett's Test of Sphericity	Approx. Chi-Square	7315.249
	df	190
	Sig.	.000
a. Based on correlations		

After prolonged use, Bartlett's Test of Sphericity validated correlation matrices. The result is 0.982 according to a Kaiser-Meyer-Olkin-developed sample adequacy metric. The researchers obtained a p-value of 0.00 by using Bartlett's sphericity test. The results of Bartlett's sphericity test were significant, indicating that the correlation matrix was not sufficient.

❖ **INDEPENDENT VARIABLE**

- **Artificial Intelligence (AI):**

Recent breakthroughs in AI over the past few years have completely transformed prevalent views of computer logic, machine intelligence, and Human-Computer Interaction (HCI). One of the most innovative breakthroughs of the current times, AI has emerged as a frontrunner. Developments in computational intelligence have enabled androids to replicate the cognitive abilities of humans for a wide range of tasks, for example, learning, solving puzzles, understanding, and translation. This breakthrough makes it possible for androids to self-learn and adapt to a wide range of environments. The impetus for this move is the belief that androids share the ability to perform tasks assigned and to exercise cautious choices. AI entails a vast galaxy of technologies, such as computer vision, robotics, machine learning, trained systems, and natural language processes. Through the blending of these technologies, individuals may design witty machines able to manage huge databases, identify trends, draw conclusions, and accomplish tasks hitherto performed by humans. The term of "artificial intelligence" entered usage by means of John McCarthy during the 1956 conference held at Dartmouth as a term for the technology of developing machines with intelligence. As time went by, AI advanced from rudimentary data-driven models imitating the cognitive abilities of humans into highly sophisticated architectures based upon rule-based programming (Chowdhary, 2020).

❖ **MEDIATING VARIABLE**

- **Innovation Construction:**

Innovation takes place at the corporate level when people from both inside and outside come together, driven by the constantly changing relationship between a company and the external environment. The innovation-fostering process, as hypothesised, features ad hoc and project-based attributes, thus lacking strategic planning. Construction firms differ from other enterprises due to their project-based character and reliance upon the activities taking place on the spot, as well as the use of temporary supply chains. Innovation finding and evaluation in the construction sphere differ from those in other industries. Innovations thus far created have defined today's industry landscape. There are two views when it comes to what innovation means. One view sees a fundamental transformation of a particular industry's character and substance, caused by a significant technological or scientific breakthrough, whereas the other views incremental innovation as a less dramatic development during which new things get added onto the top of the previously accrued knowledge. Sceptics argue that, especially in the context of the construction industry, new things tend to appear as a mere adjustment of the previously established product or service, rather than as a real transformation. As a result, due to the development of technology as well as procedure, many of the players involved in the construction market view the widespread diffusion of novelty-based practice as a sign of innovation (Nguyen, 2021).

❖ **DEPENDENT VARIABLE**

- **Intelligent pedigree of Chinese traditional silk design**:

Because intelligent pedigree term represents and improves traditional Chinese culture, traditional Chinese auspicious patterns and silk attire complement each other. The usage of auspicious motifs in silk apparel design was prevalent across several Chinese dynasties. The skilful use of auspicious motifs in modern silk garment design serves the twin purpose of elevating global proficiency while also conveying a distinct Chinese essence. In this lineage, both the static (spatial characteristics at a certain point in time) and the dynamic (cultural transformations over the course of a given period) aspects of the evolution of the spaces in these villages have been included. It has been found that some of these communities have achieved a high degree of sustainability and outstanding artistic quality after using traditional construction methods and architectural ideas over an extended period. It is also widely believed that traditional villages and silk design must have a lineage for their material and immaterial legacy to be passed down and preserved. Sustainable textile designers can learn a lot from the more rudimentary and less deliberate sustainable technology used in these communities (Li, 2022).

- Relationship between AI and the intelligent pedigree of Chinese traditional silk design considering innovation construction:

The relations between AI and Chinese traditional silk design's intelligent ancestry are a dynamic junction of technical innovation and cultural heritage preservation. The intricate patterns and symbolism of Chinese silk design embody decades of cultural identity and artisanal workmanship. AI can revolutionise this realm while maintaining beauty. Machine learning and computer vision help designers analyse and reproduce traditional silk themes, permitting them to experiment while keeping authenticity. AI algorithms can study ancient silk designs, create modern designs based on traditional themes, and support craftspeople recounting patterns precisely. This improves efficiency and cultural continuity in contemporary production. AI-driven digital archiving and pattern recognition help preserve China's silk legacy. AI helps restore forgotten skills and geographical variances by digitising and analysing old silk artworks. This clever pedigree preserves ancient workmanship and innovates reinterpretations, promoting a cultural conversation between past and present. AI helps modernise silk design via innovation building. It promotes ancient aesthetics and modern design, creating new markets and creative expressions. AI-powered customisation lets users make personalised silk goods that respect heritage and embrace current desires. AI protects and innovates Chinese traditional silk design. It deepens the intellectual pedigree by encouraging innovation, cultural preservation, and sustainable growth in the traditional craft, boosting worldwide admiration of Chinese silk artisanry (Zhang & Krotova, 2024).

Considering the above discussion, the researcher developed the following hypothesis, which analysed the relationship between AI and the intelligent pedigree of Chinese traditional silk design considering innovation construction.

“H01: There is no significant relationship between AI and the intelligent pedigree of Chinese traditional silk design considering innovation construction.”

“H1: There is a significant relationship between AI and the intelligent pedigree of Chinese traditional silk design considering innovation construction.”

ANOVA

Sum

Source	Sum of Squares	df	Mean Square	F	Sig
Between Groups	78,158.735	159	491.564	301.901	0.000
Within Groups	798.754	489	1.633		
Total	78,957.489	648			

In this analysis, the result is significant. The value of F is 301.901, which reaches significance with a p-value of .000 (which is less than the .05 alpha level). This means the “H1: There is a significant relationship between AI and the intelligent pedigree of Chinese traditional silk design considering innovation construction” is accepted and the null hypothesis is abandoned.

9.DISCUSSION

These studies demonstrate how AI significantly contributed towards innovation generation and intellectual pedigree preservation of Chinese traditional silk design, especially in innovation generation. This confirms the assumption that AI connects traditional handicraft and modern technology. AI's pattern analysis, digitised archiving, and generative design

transformed cultural preservation and innovation. Cultural custodians and designers may trace historical silk design elements and test new interpretation usage through machine learning and computer vision. This made cultural preservation possible and allowed for sustainable Chinese silk art development against the pressures of modern art and wardrobes. AI-based technologies render silk design interactive and dynamic, enabling customisation and market-responsive products without cultural dilution. AI's data analytics and traceability of pattern enable the generation of an "intelligent pedigree"—a phylogenetic record of silk motif origin, adaptation, and symbolic interpretation. This ensured the preservation of the intangible cultural heritage and generated innovation by providing the silk designer with abundant historical citations and new possibilities for silk art design. The report also highlighted the importance of integrating AI into innovation formation. This necessitates cultural institutions, craftspeople, and engineers working together for sustainable and evolving systems of silk art design. This positive relationship demonstrates the potential for AI-activated innovation to continue, keeping ancient silk design designs fashionable and contemporary against the pressures of the globalised internet age. Lastly, the close interconnection of AI and Chinese silk design's intellectual heritage demonstrates technology integration as potentially revolutionary for cultural preservation and innovation. This allowed for cultural heritage preservation and creative remaking of these cultural artefacts, boosting Chinese silk handicraft globally.

10. CONCLUSION

The comprehensive analysis, which was conducted within the context of innovation creation, demonstrates a significant and advantageous relationship between AI and the preservation of the intelligent lineage of traditional Chinese silk design. Based on the findings, AI methods like pattern recognition, computer vision, and machine learning were essential for the preservation, analysis, and innovation of traditional silk designs. By digitally storing and categorising historical themes, AI contributes to the preservation of cultural history; in addition, AI made it possible for new interpretations to emerge that appeal to consumers in the present day. In addition, the sustainable growth of silk design is promoted by AI-driven innovation building, which allowed designers and craftspeople to effortlessly combine traditional aesthetics with innovation. Chinese silk artistry may thrive in the digital era thanks to this study's emphasis on AI's revolutionary potential as a preservation tool and cultural innovation catalyst. Incorporating AI into the rich history of Chinese silk design had the potential to boost worldwide industrial development, encourage creative expression, and preserve cultural heritage.

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