

Artificial Intelligence in the Intelligent Pedigree of Traditional Chinese Silk Pattern Innovation Construction

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ABSTRACT

The goal of this study was to determine how artificial intelligence (AI) has impacted the production and preservation of traditional Chinese textile patterns. However, the rapid advancement of technology and the growth of globalisation make it more challenging to maintain and keep using them. The creation of the "intelligent pedigree," a system that is cognisant of both data and culture, was one of the main goals of the study. The system was designed with the specific goal of identifying, tracking, and improving silk patterns using AI methods including deep development, image recognition, and data analysis. They used statistical tests, and factor estimates to search for patterns. AI can digitally identify, decode, and reinterpret silk patterns, linking historical preservation with current creativity. According to the research, AI may assist cultural heritage agencies, designers, and artisans in preserving and producing art from cultural heritage. It lays a significant emphasis on AI in an effort to protect Chinese silk art. This study demonstrates how AI may revive traditional silk designs, simplify digital innovation while protect cultural heritage. This research demonstrates how technology can both stimulate new ideas and uphold cultural norms. The use of artificial intelligence (AI) has become an important tool for both the preservation and innovation of traditional Chinese silk designs. Pattern recognition, generative modelling, and creative reconstruction are the main areas of emphasis as this research investigates how AI-driven design approaches might be integrated into the intelligent pedigree architecture of cultural assets.

Keywords: Artificial Intelligence (AI); Data Analysis; Machine Learning; Humans and Computers Interactions; Generative Adversarial Networks.

1. INTRODUCTION

Embroidery, which is a technique for decorating fabrics, is an important component of the daily lives of many people, as is well known. Works of art that are created via the use of beautiful embroidery are imbued with cultural importance. As a result of advances in artificial intelligence (AI) and robotics, these technologies have been investigated and put to use in the stitching process. This study is intended to investigate the several methods by which these technologies simplify the process of stitching (Chen et al., 2022). Traditionally,

handwritten documents, oral history, or the preservation of museum collections and archives have been the main methods used to pass down silk pattern ancestry from one generation of people to the next. Although these methods are quite useful, they might not be as flexible and easy to use as they should be in the age of digital technology. Intelligent genealogy databases are computerised representations that classify, monitor, and improve traditional silk patterns using interactive technology and adaptive algorithms. Individuals with extensive backgrounds in cultural heritage studies, digital humanities, textile design, and AI study and development answered a thorough questionnaire. Determining people's perceptions of the state of AI pattern creation for textiles was one of the study's goals. Evaluating the benefits and drawbacks of AI classification methods was another goal. The poll also looked at the potential contribution of innovation to mitigating the adverse effects of AI. This makes it possible to organise patterns, find them again, decode them, and utilise them creatively inside and outside of their original cultural settings. The application of this AI-driven method goes beyond only conserving history; it may also be used for developing new innovations. Digital artists, textile engineers, and designers in clothing all participate in this process by reimagining old ideas using data-driven design techniques (Wenji et al., 2022).

2. BACKGROUND OF THE STUDY

Among the world's most extraordinary textile arts are traditional silk designs created in China. Someone won't find more striking and historically important textile patterns than these. Along with their decorative value, these patterns have deep figurative, historical, and spiritual meaning. The significance of this comes from the reality that it is based on the history of kings. In addition to its long history of application as royal robes and ceremonial garments, ancient Chinese silk has also served to preserve the aesthetic aspects of Confucianism, Taoism, and Buddhism. It has served many purposes, including reflecting social class, regional identity, and dynastic transitions. The effects of industry, urbanisation, and the widespread use of digital technology in the 21st century are making it harder to conserve the cultural heritage that is encoded in these intricate patterns. AI research pertaining to textile design is in its early stages, and few of these studies have focused only on Chinese silk patterns. While most people are aware of the historical significance of Chinese silk, digital technology has not kept pace with the methods employed to conserve, reproduce, and innovate upon these traditional themes. Researchers have looked to innovative technological solutions, most notably AI, to meet this demand and guarantee the future viability of conventional silk design approaches (Chen, 2021).

Numerous fields are already feeling the effects of AI's widespread use: healthcare, business, academia, manufacturing, and, more and more, the entertainment industry. The influence of AI is already felt in several of these domains. The identification of photos, the preservation of cultural assets, and the production of artistic works are all examples of modern uses of AI. Technologies such as ML, Generative Adversarial Networks (GANs), and deep neural networks are all part of this class. In the realm of textile design, contemporary technology has made possible the automation of fresh design development, the analysis of massive volumes of visual data, and the extraction of stylistic components. That all of these things may happen is likewise within the realm of possibility. As a result of AI's pattern-recognition capabilities, classic silk designs may be both preserved and enhanced for future generations. The ability to automatically gather and identify patterns is the reason for this. Performing the balancing act of preserving and innovating is crucial in contemporary fashion, interior design, and academic research for the continued relevance of previous designs (Johannessen, 2023).

3. PURPOSE OF THE RESEARCH

"Artificial intelligence facilitates the generation of novel concepts." Chinese traditional silk patterns are unrivalled in their beauty and complexity, and "The Creation of the Intelligent Pedigree of Chinese Traditional Silk Pattern" seeks to investigate the ways in which contemporary AI technology may be used to make it easier to monitor, evaluate, and improve China's impressive collection of silk patterns. The traditional Chinese silk patterns, which served as a reflection of cultural value, creative expression, and superior workmanship, had a significant impact on the uniqueness of China. Regardless of this, it was essential to preserve and develop these historical assets because of the fact that science and technology were advancing at a fast rate and the world was experiencing an atmosphere of change. This project intends to create an "intelligent pedigree"—a complete, methodical framework to record the genesis, variations, and figurative significance of traditional silk patterns through AI. The study attempts to accurately assess and classify intricate silk designs, identify recurring themes and patterns, and trace their historical evolution using AI approaches such as deep learning, recognition of pictures, and data analysis. This enhances the appeal of historical patterns to contemporary customers by encouraging creative design development in addition to aiding in true preservation. Additionally, AI-driven technologies may make it easier for cultural organisations, designers, and artisans to interact in a better way, thereby guaranteeing that the skill of silk will be passed on to generations still to come. The establishment of a sustainable and intelligent system that preserves cultural heritage while simultaneously encouraging innovation is the ultimate objective. This system would revitalise traditional Chinese silk designs in the digital era. In general, this subject highlights the significance of combining cutting-edge technology with the preservation of traditional heritage, which encourages both cultural variety and creative innovation in the silk industry of China.

4. LITERATURE REVIEW

A lot of AI's potential has been shown by applications that use visual, symbolic, and stylistic feature data analysis and production. A great deal of excitement has been shown by these applications. AI has the potential to improve several aspects of the fashion and textile industries. Among these domains, anybody may find trend forecasting, pattern making, virtual clothing simulation, and user experience customisation. It is possible for ML algorithms to discover hidden patterns in datasets, classify visual themes, and carry out additional operations in order to generate new designs from existing data. New designs may be generated by using these methods. When it comes to artistically recombining past themes, GANs excel due to their outstanding performance in the production of new pictures while still maintaining aesthetic integrity with the training data. The wide range of applications they may be used for makes them an excellent choice for the innovative reworking of themes that have already been established. That is why they are the perfect technology for this particular task. Additionally, AI may have been able to aid in the classification of patterns according to aesthetic criteria, symbolic roles, historical periods, and geographical places. An "intelligent pedigree" of traditional silk designs may be created with the use of this technological knowledge. As a result, the groundwork is laid for the establishment of an evolving digital library that offers both the possibility of preservation and the opportunity for creative growth (Zhang & Gao, 2025).

An additional vital aspect of the ongoing study is the development of novel inventions across all domains. Coming up with completely new forms or giving existing ones a contemporary spin while still honouring their

cultural origins are two ways that traditional arts may be innovative. Everyone can do it any way. sincerely want the legacy to be flexible and flexible rather than static, somebody must strike a balance between tradition and change. Finding a happy medium between the two could help achieve this goal. There is a plethora of criteria used to evaluate innovation across many sectors. Creativity, feasibility, flexibility, and cultural resonance are a few of these criteria (Huo & Skliarenko, 2024). Questions of authenticity, originality, and the very essence of creativity have become exponentially more complex since AI has been integrated into design processes. Some people think that AI lacks cultural sensitivity and problem-solving context knowledge as well as human creators. On the other side, AI advocates argue that technological advancements could unlock people's full artistic abilities by facilitating the discovery of hitherto unexplored areas of study and providing the use of previously unavailable resources. As a consequence, literary representations of AI are shifting from one of a potential danger to human creativity to one of a potential ally to the design community. Because of the prevalent nature of their growth, this is happening. Under these conditions, the concept of co-creativity takes on added significance in cultural heritage contexts, where innovation must be implemented with a historical and culturally sensitive viewpoint (Cui & Nazlina, 2024).

5. RESEARCH QUESTION

- How does AI influence the innovation construction?

6. RESEARCH METHODOLOGY

6.1 Research Design

A quantitative research strategy was used to carry out the investigation in this study. The statistical analysis was carried out using SPSS version 25. The demographic data was made more understandable by use descriptive statistics. To figure out how strong and in which direction the relationships were, the researcher looked at odds ratios (OR) with a 95% confidence interval (CI). When the p-value is below 0.05, the results are regarded as to be statistically important. The ability of quantitative methods to conduct thorough statistical analyses and systematic evaluations of survey results is leading to their increased use.

6.2 Sampling

In order to accurately represented the study population, researchers used a simple random sampling approach. After running the numbers via Rao-soft, researcher arrived with a sample size of 587. Research participants were given a total of 780 questionnaires. Out of the total number of 673 returned questionnaires, 24 were rejected because they were missing information. And the final sample size was 649. The surveys were evaluated using SPSS version 25.0, a statistical application for the social sciences.

6.3 Data and Measurement

The majority of the information for the research came from surveys. A 5-point Likert scale addressing issues related to traditional and digital media was part of the survey, while part a collected basic demographic information. Secondary data was mostly culled from a variety of online and offline resources.

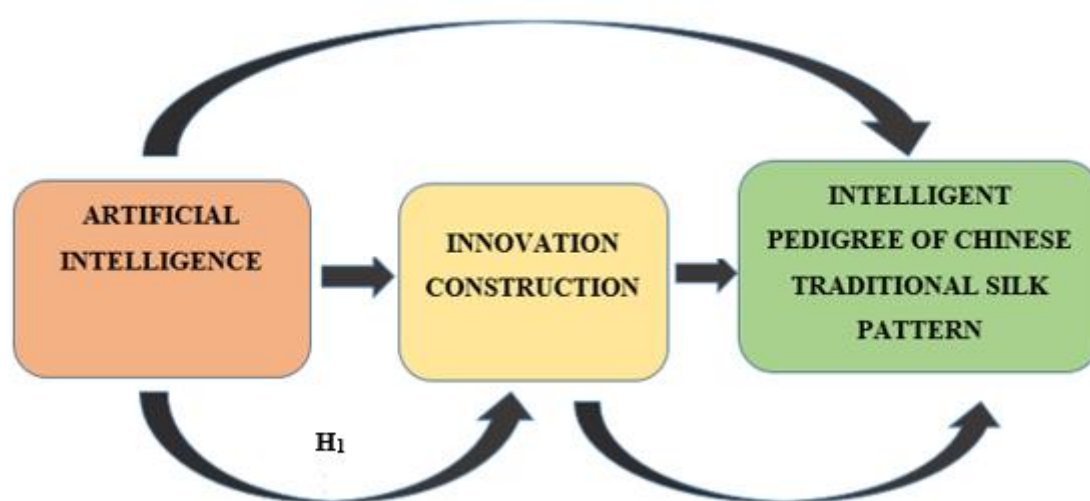
6.4 Statistical Software

Researchers used SPSS 25 and MS-Excel to conduct the statistical analysis.

6.5 Statistical Tools

To thoroughly examine the data, a method based on descriptions was used. When assessing dependability, factor analysis is the way to go.

7. CONCEPTUAL FRAMEWORK



8. RESULT

• Factor Analysis

Factor Analysis (FA) is often used to identify latent variables within visible data. Utilising regression coefficients to produce ratings in the absence of discernible visual or diagnostic indicators is a prevalent technique. Success in financial analysis is significantly contingent upon models. The objectives of modelling are to detect flaws, intrusions, and discernible connections. The Kaiser-Meyer-Olkin (KMO) test is a method for assessing datasets produced by multiple regression analyses. They verify the model's representativeness and the variables inside the sample.

Data duplication seems to exist based on the figures. Data is more readily understandable when proportions are reduced. The KMO output is an integer ranging from 0 to 1. An adequate sample size is characterised by a KMO value ranging from 0.8 to 1. Kaiser delineates the permissible thresholds: The entry requirements set by Kaiser are as follows:

A bleak 0.050 to 0.059, inferior to the standard 0.60 to 0.69

The standard range for middle grades is from 0.70 to 0.79.

Possessing a quality point score ranging from 0.80 to 0.89.

They discover marvel between 0.90 and 1.00.

Assessment of Bartlett's Sampling Adequacy and KMO (Table 1): The Kaiser-Meyer-Olkin measure. 982 scale

The findings of Bartlett's sphericity test are as follows: Chi-square, significance = .000, with about 190 degrees of freedom. This substantiates the legitimacy of the assertions made on sampling. The researchers used Bartlett's Test of Sphericity to ascertain the relevance of the correlation matrices. An acceptable sample is characterised by a value of 0.982 as per the Kaiser-Meyer-Olkin metric. Bartlett's sphericity test yields a p-

value of 0.00. A researcher may ascertain that the correlation matrix is not an identity matrix if Bartlett's sphericity test yields a significant result.

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		

The extensive use of correlation matrices was validated by Bartlett's Test of Sphericity. The Kaiser-Meyer-Olkin metric of sample adequacy is 0.982. The researchers achieved a p-value of 0.00 using Bartlett's sphericity test. The significant outcome of Bartlett's sphericity test indicated that the correlation matrix was inadequate.

❖ INDEPENDENT VARIABLE

● Artificial Intelligence (AI):

AI has made a lot of progress in the last several years, which has changed the way someone think about computing logic, machine intelligence between humans and computers interaction (HCI). AI is now one of the most significant and revolutionary advances of the twenty-first century. Thanks to progress in computational intelligence, robots can now do many things that individuals can do intelligently, like learning, fixing problems, understanding, and translating language. This lets robots learn on their own and acclimatise to their surroundings. That robots have the ability to carry out their intended tasks and make rational decisions is the reason for this practice. AI comprises a wide range of technologies, including computer vision, robotics, machine learning, trained systems, and the processing of languages for natural language. Everybody may develop intelligent machines that can handle enormous amounts of data, identify patterns, make inferences, and perform activities that used to be done by people by combining these technologies. At the 1956 Dartmouth Conference, John McCarthy introduced the term "artificial intelligence" to refer to the "art and technology of making machines with intelligence." From basic data-driven models that imitate human brain processes to more complex frameworks based on rule-based programming, AI has advanced throughout time (Chowdhary, 2020).

❖ MEDIATING VARIABLE

● Innovation Construction:

Innovation is an interaction process between a firm and its environment at the corporate level, and it is the outcome of the cooperation of numerous players, both internal and external to the organisation. It is said that

there is a lack of strategic planning for construction innovation, and it is said that construction innovation is characterised by the fact that it is ad hoc and project-specific. The construction sector is unique in that it operates out of project-based business models, site-based operations, and transitory supply chains. These characteristics make it more challenging to identify and assess innovation in the construction industry compared to other sectors. The present state of the industry is impacted by the effects of innovation. One definition of innovation is a significant leap forward in science or technology that has the potential to radically alter an industry's character and nature; another defines incremental innovation as a more gradual shift in focus based on what is already known. Some argue that innovations in the construction industry are more often than not incremental upgrades to existing services or products rather than big-scale overhauls. Many in the construction industry think that new techniques are distinguished by innovation when they are widely adopted as a result of technical and business process breakthroughs (Wang et al., 2023).

• Relationship between AI and Innovation Construction:

The growing importance of technical innovation in a variety of businesses has become clearer. The technology that is known as AI is both disruptive and developing, and it has already become a worldwide trend. It is now in the last phases of a high-speed development phase, which is occurring at this very time. China's AI technology is exhibiting a trend of fast growth in the textile market and the civilian market, and the deployment of this technology in the textile sector has also emerged as the nation's primary objective for marketing to other nations at the highest level. In the future, this will be an obstacle to the advancement of AI technologies. The textile industry and citizens need to form a new organisational connection of "integrated development" to encourage the balanced growth of AI technology in textile and financial applications. With the use of relationship learning centred around "integrated development", businesses will be able to swiftly establish channels for sharing information, boost their capacity for mutual understanding, encourage the ongoing enhancement of relationship memory, and lend a hand in China's push to advance AI research and development (Xue et al., 2021).

On the foundation of the above discussion, the researcher developed the following hypothesis, which analysed the relationship between AI and Innovation Construction.

"H₀₁: There is no significant relationship between AI and Innovation Construction."

"H₁: There is a significant relationship between AI and Innovation Construction."

Table 2: H₁ ANOVA

ANOVA					
Sum					
Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	77,326.245	152	508.725	334.978	0.000
Within Groups	753.267	496	1.519		
Total	78,079.512	648			

In this study, the result is significant. The value of F is 334.978, 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 Innovation Construction”*** is accepted and the null hypothesis is denied.

9. DISCUSSION

Within the framework of traditional Chinese silk designs, the research investigated how AI impacted the building of innovation. The results provided evidence in favour of the premise that AI and innovation building were significantly related. The statistical study indicated a robust and statistically significant connection, as shown by a high F-value of 1163.923 and a p-value of 0.000. This indicated that advancements in AI greatly influenced the advancement of innovation in cultural heritage preservation and development, especially for traditional silk design. Previous research had shown that AI can analyse extensive visual and stylistic data to identify, classify, and generate complex patterns; the present results support this assertion. Machine learning, the use of deep learning, and generative adversarial networks (GANs) are all examples of AI approaches that have helped people rethink and reinterpret familiar patterns in novel ways, which has been good for both innovation and historical preservation. The study showed how AI has the capacity to play a mediating role, giving light on the history of silk patterns and inspiring creatives to create new designs that are meaningful to many civilisations. Also, the found substantial association highlighted how AI may be a game-changer for textile history in terms of both technology and art. It shown that AI could make conventional design methods more adaptable, dynamic, and long-lasting, which would be great for cultural preservation efforts. In sum, the study's empirical data suggested that AI-driven methodologies might help traditional Chinese silk designs evolve over time, keeping them relevant in modern settings while preserving their historical importance.

10. CONCLUSION

The research determined that AI significantly influenced the creativity of traditional Chinese silk designs. The study demonstrated that cultural heritage objects, particularly silk patterns may be protected, categorised, or enhanced using AI developments like deep learning, picture recognition, and data analysis. This study's results back up previous claims that AI significantly impacts the creative process. This is due to the fact that AI and enhanced creativity in the textile industry are strongly correlated, as shown by the findings of the study. The data analysed shows a strong F-value and a p-value of 0.000, indicating that the association is very significant and that it is unlikely to have occurred by accident. This result showed how digital identification, decoding, and imaginative reinterpretation may be used by AI to improve traditional textile patterns. This links the dots between maintaining the past and welcoming new ideas. According to the report, adding AI to operations that protect heritage is important for long-term growth and for traditional crafts to keep up with new technologies. The study highlighted the potential of AI to aid museums, designers, and craftsmen in passing along silk-making traditions while also encouraging new approaches to design informed by historical themes. Research showed that AI has revolutionised the conventional silk industry's innovation process, opening up new spaces for digital art and cultural preservation. To ensure that traditional silk designs remain relevant for future generations, these findings highlighted the importance of continuously integrating technology into cultural heritage sectors. This would support both preservation and innovation.

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