

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

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ABSTRACT

The aim of this research is intended to investigate the potential of Artificial Intelligence (AI) to further the sophisticated lineage of traditional Chinese silk design. To ensure the continued relevance of these unique representations of China's cultural heritage in contemporary design settings, it is imperative to preserve, modernise, and intelligently systematise traditional silk patterns, which represent a distinctive manifestation of China's cultural past. In this research, innovation construction serves as the mediating variable, while AI functions as the independent variable. The dependent variable in this research is the intellectual pedigree of traditional Chinese silk patterns. By using AI technologies like data analysis, pattern recognition, and machine learning (ML), researcher can create a database that is both well-organised and continually evolving, which means it can store the historical, artistic, and functional aspects of silk patterns. Researchers are looking at using AI tools to change and enhance traditional designs in the process of developing new ideas. The researchers collect data using standardised questionnaires and then use statistical tools to look at how the factors are related. If it is properly maintained, the cycle will keep running until the data collecting procedure is done. The study findings should indicate that AI is the innovative catalyst behind the creation of a complex system for delineating family trees. This indicates that people will be more prepared to understand, transmit, and enhance traditional Chinese silk designs. This study has yielded findings indicating that several academic disciplines might gain from the integration of technical advancements and cultural heritage. There are many ways that this kind of integration might happen. Making new things is a factor that changes how silk items are usually made. Innovation has been a big part in making changes in the area of artificial intelligence.

Keywords: Artificial Intelligence, Data Analysis, Machine Learning, Textile Design, Human-Computer Interaction.

1. INTRODUCTION

Many people have thought for a long time that China's traditional silk patterns are important emblems of the country's long and rich heritage in the arts, culture, and history. People have utilised these designs for a long time to make clothes, fabrics, and art seem better. Because of this, they have been successful in their attempts

to learn about the ideas and concepts that have been handed down from generation to generation over a long period of time. It has become increasingly vital to look at the several approaches that may be used to preserve, update, and reinterpret these outdated patterns in cultural heritage and design innovation. This is because modernism and digital technology have a big effect on the design and cultural practices of people all over the globe. AI has shown its capacity to serve as a catalyst for transformation in the preservation, investigation, and production of cultural objects. Because of this, it is giving us new ways of looking at things and altering how we think about specific areas of study. The goal of this project is to create a system that may change in new ways while yet keeping the historical accuracy of the old Chinese silk patterns utilised in the designs. For a system like this to work, both data and culture would be very important parts (Wenji et al., 2022). To accomplish this objective, the influence of AI on the creative evolution of their intelligent lineage will be critically examined.

In the past, individuals would share knowledge about the history of silk patterns with each other via oral traditions, written records, or the slow growth of libraries and museums. "Intelligent pedigrees" as digital models can employ algorithms and interactive technology to assist people to use these computer models to view, sort, and improve designs made with regular silk. All of the professionals who were given the opportunity to fill out a questionnaire are considered experts in their industry. These individuals work in the following areas: textile design, cultural heritage studies, AI research and development, and digital humanities. To gather information about people's thoughts on the present status of AI, it was identified that making designs for textiles, the pros and cons of AI classification systems, and how innovation may help lessen the bad consequences of AI may help in future innovation scopes. Organising patterns, locating them again, deciphering them, and putting them to creative use both inside and outside of their original cultural contexts are all made feasible as a result of this. The use of this AI-driven approach extends beyond the realm of historical preservation and into the realm of innovation creation. In this process, data-driven design methodologies are utilised to reinterpret themes for new applications in digital art, textile engineering, and fashion (Cui & Nazlina, 2024).

2. BACKGROUND OF THE STUDY

Traditional silk patterns from China are among the most remarkable examples of textile art in the world. These designs are among the most magnificent and historically significant examples of textile art. Not only are these patterns utilised for adornment, but they also have great symbolic, historical, and spiritual significance. This significance stems from the history of dynasties that have been handed down from generation to generation. At the same time as it has been utilised for ceremonial clothes and royal robes, traditional Chinese silk has also been used for the purpose of preserving the aesthetic qualities of Buddhism, Taoism, and Confucianism. Reflecting socioeconomic status, regional identities, and dynastic shifts are some of the ways that it has been used. It is becoming more difficult to preserve the cultural past that is preserved in these complex patterns as a result of the consequences of industrialisation, urbanisation, and the extensive use of digital technology in the twenty-first century. Research into the use of AI in textile design is still in its infancy, and there is a dearth of studies that concentrate exclusively on Chinese silk designs. Digital technology has not been able to keep up with the ways that are used to preserve, replicate, and innovate upon these traditional themes, despite the fact that there is widespread knowledge of the historical value of Chinese silk among the general public. For the purpose of satisfying this need and ensuring that traditional silk design techniques will continue to be

feasible in the future, researchers have turned to cutting-edge technology alternatives, the most notable of which is AI (Sa et al., 2024).

The use of AI is already having a substantial impact on a broad range of sectors, including the medical field, the business world, academic institutions, the production industry, and increasingly, the arts and entertainment. A number of these fields are already being significantly impacted by AI. Examples of contemporary applications of AI technology include the creation of works of art, the recognition of photographs, and the protection of cultural assets. Deep neural networks, Generative Adversarial Networks (GANs), and ML are some of the technologies that fall under this category. Automating the development of new designs, analysing enormous amounts of visual data, and extracting stylistic components are all made feasible by modern technologies when it comes to the design of textiles. It is also conceivable for all of these things to occur. AI has the ability to not only secure the continuity of traditional silk designs but also to strengthen their development in the future by automatically collecting and identifying patterns. This is because of the fact that it can automatically collect and detect patterns. When it comes to modern fashion, interior design, and academic research, it is vital to perform the dual task of preservation and innovation in order to ensure that older designs continue to be relevant (Guo et al., 2025).

3. PURPOSE OF THE STUDY

Investigating and assessing the influence of AI on field of traditional Chinese silk arts' originality was the main goal of this project. Particular focus was on creating an intelligent lineage system for these designs. Given the fast digital change of established companies including the creative and cultural sectors, there is an increasing need for technologies able to archive, analyse, and revive artistic forms as part of cultural legacy. Once seen as emblems of dynasty culture, creative expression, and regional identity, Chinese silk designs are now under great difficulty. Lack of standard procedures for inheritance and categorisation, declining hand workmanship, and poor documentation techniques are the sources of these difficulties. The study looked at how AI technologies including as ML, pattern recognition, and intelligent design tools might possibly help in the maintenance of silk pattern design systems as well as the development of new ones in order to address these issues. The project intends to build an intelligent framework (a digital lineage) documenting, researching, and extending traditional silk topics. This was achieved by considering as an independent variable the role AI performs. Though important, traditional documentation methods are time-consuming, inadequate, and subjectively prone. AI was incorporated into this field with the aim of ascertaining the degree to which it might improve categorisation methods in terms of efficiency, consistency, and accuracy, so opening opportunities for the development of new motifs that are culturally accurate. Apart from that, the major goal of the study was to grasp how AI may evolve alongside people rather than merely serving as a tool for reproduction, therefore reflecting conventional patterns in conjunction with humans.

4. LITERATURE REVIEW

Applications that incorporate the analysis and creation of data that shows visual, symbolic, and stylistic features have shown a great amount of promise for AI. These applications have showed a lot of enthusiasm. It has been shown that AI may be beneficial in a range of areas within the textile and design sectors. These areas include the prediction of trends, the creation of patterns, the simulation of virtual clothes, and the

tailoring of user experiences. In order to develop new designs from previously acquired data, it is feasible for ML algorithms to search datasets for hidden patterns, categorise visual themes, and execute other processes. These approaches may be used to generate new designs. GANs stand out when it comes to artistically recombining past themes because of their outstanding track record of producing new visuals while maintaining stylistic coherence with training data. This makes them an ideal choice for artistically recombining previous themes. Because of this, they are an especially well-suited technology for this specific endeavour. Furthermore, it is possible that AI was able to provide assistance in the process of grouping and categorising patterns in line with aesthetic principles, symbolic functions, historical eras, and geographical locations. With the assistance of this technical expertise, it is possible to construct an "intelligent pedigree" of classic silk patterns. This creates the foundation for the creation of a digital library that is continually changing and that provides the potential for preservation as well as creative development (Deng & Zhu, 2023).

One further important component of this research that is now being carried out is the creation of new innovations of all kinds. When it comes to traditional arts, innovation may mean either coming up with wholly new forms or giving current ones a new twist while still paying attention to their cultural roots. Both of these options are possible. It is vital to find a balance between tradition and change in order to ensure that legacy is not static but rather dynamic and adaptive. This may be accomplished by striking a balance between the two. There are many different metrics that are used in the process of assessing innovation in a range of different industries. Some of these metrics include novelty, practicability, adaptability, and cultural resonance. As a consequence of the incorporation of AI into design processes, the concerns of authorship, authenticity, and the underlying core of creativity have become inherently more complicated. Critics of AI contend that it is incapable of competing with human designers in terms of cultural knowledge and understanding of the environment in which problems arise. The proponents of AI, on the other hand, say that technology has the ability to increase human creativity by supplying new resources and opening up new fields of inquiry with new opportunities. The result of this is that AI is being portrayed in literature less as a threat to human creativity and more as a friend to designers. This is a consequence of the fact that they are becoming more prevalent. Given the conditions, the idea of co-creativity becomes even more pertinent when it comes to cultural heritage settings, which need innovation to be carried out with a historical and culturally sensitive sense of perspective (Tang & Shi, 2024).

5. RESEARCH QUESTION

- What role does AI play in supporting the intelligent pedigree of Chinese traditional silk patterns?

6. RESEARCH METHODOLOGY

6.1 Research Design

The SPSS version 25 was used for the quantitative data analysis. A 95% confidence interval and odds ratio were used by the researchers to assess the direction and strength of the statistical association. A statistically significant criteria was established by the researchers at $p < 0.05$. The data's basic features were revealed via a thorough investigation. Quantitative methods are often used to evaluate data collected via polls, questionnaires, and surveys, as well as data analysed using computing tools for statistical evaluation.

6.2 Sampling

The sample size determined using Rao-soft software was 587. A total of 780 questionnaires were given to participants in the research. Of these, 673 sets of questionnaires were returned, and 24 of those sets were discarded due to incompleteness. The statistical program is 649 for social science (SPSS version 25.0) software was used to evaluate the questionnaires.

6.3 Data & Measurement

The study mostly utilised data acquired from a questionnaire survey. The participant's essential demographic information was requested first. Participants were subsequently given a 5-point Likert scale to evaluate the online and offline channels. The researchers rigorously analysed several resources, especially internet databases, for this secondary data acquisition.

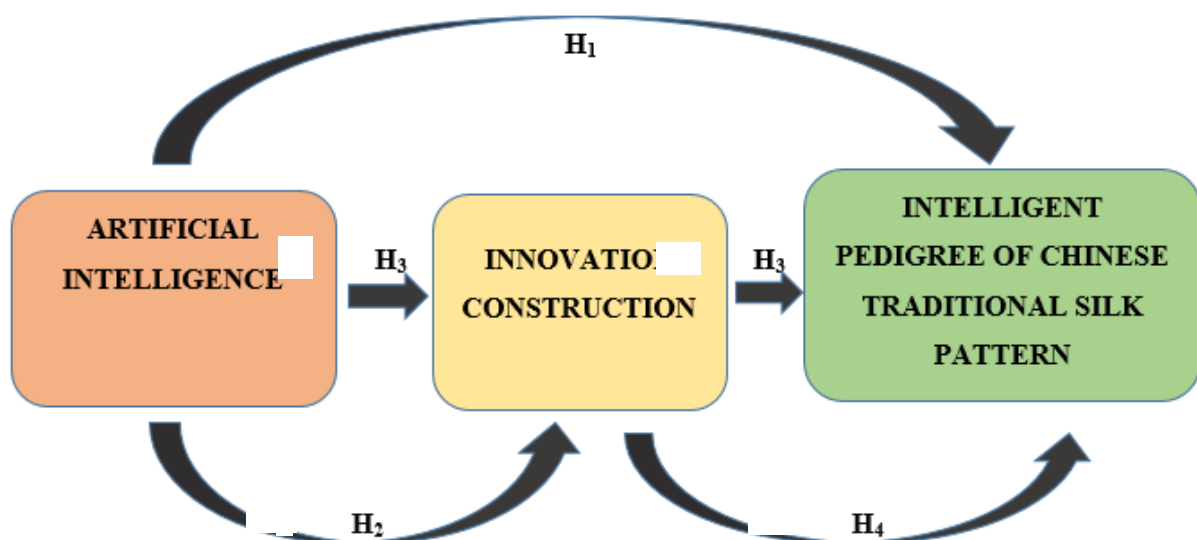
6.4 Statistical Software

The statistical analysis was conducted using SPSS 25 and MS Excel.

6.5 Statistical Tools

The primary characteristics of the data were understood via the use of descriptive analysis. Using ANOVA, the researcher must examine the data.

7. CONCEPTUAL FRAMEWORK



8. RESULT

• Factor Analysis

Factor Analysis (FA) is often used to find hidden variables in observable data. It is common practice to use regression coefficients to generate ratings when there are no easily visible visual or diagnostic signs. Success in FA is highly dependent on models. The goals of modelling are to identify errors, intrusions, and apparent linkages. The Kaiser-Meyer-Olkin (KMO) Test is one tool for evaluating datasets that have been generated by numerous regression analyses. The representativeness of the model and the variables in the sample are checked by them. There seems to be data duplication based on the numbers. Data is more easily

comprehensible when proportions are smaller. The output of KMO is an integer from 0 to 1. A sufficient sample size is defined as a KMO value between 0.8 and 1. According to Kaiser, these are the acceptable limits: The standards that Kaiser has established for admission are as follows:

A dismal 0.050 to 0.059, worse than the typical 0.60 to 0.69

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

Having a quality point score between 0.80 and 0.89.

Between 0.90 and 1.00, they find wonder.

Testing for Bartlett's Sampling Adequacy and KMO (Table1) The Kaiser-Meyer-Olkin .982 scale

According to Bartlett's sphericity test, these are the results: chi-square, sig. =.000, about 190 degrees of freedom this proves that the statements made for sampling were legitimate. In order to determine whether the correlation matrices were relevant, the researchers used Bartlett's Test of Sphericity. An adequate sample is defined as one with a value of 0.982 according to the Kaiser-Meyer-Olkin measure. The results of Bartlett's sphericity test provide a p-value of 0.00. Researcher can tell the correlation matrix isn't an identity matrix if Bartlett's sphericity test returns a positive 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		

In addition, the widespread use of correlation matrices was confirmed by Bartlett's Test of Sphericity. The sample adequacy measure, as measured by Kaiser-Meyer-Olkin, is 0.982. Using Bartlett's sphericity test, the researchers obtained a p-value of 0.00. A substantial result of Bartlett's sphericity test demonstrated that the correlation matrix was ineffective.

❖ INDEPENDENT VARIABLE

• Artificial Intelligence

AI has become among the most significant and innovative technologies of the twenty-first century thanks to its rapid development, which has redefined the boundaries of computational logic, machine cognition, and Human-Computer Interaction (HCI). AI is the capacity of robots to reproduce traits of human cognition, including learning, reasoning, problem-solving, perception, and language understanding, therefore enabling autonomous decision-making and adaptive functioning. This is done so that robots may run appropriately and make decisions. Among the many technologies spanning a conceptual approach in the wide range of AI, are

computer vision, expert systems, robotics, ML, and Natural Language Processing (NLP). Combining these technologies will enable intelligent systems to be built that can evaluate vast volumes of data, spot patterns, provide insights, and carry out jobs formerly only humanly relevant. During his 1956 presence at the Dartmouth Conference, John McCarthy first referred to "the science and engineering of making intelligent machines" as "artificial intelligence". AI has developed historically from rule-based programming paradigms to complex data-driven models that emulate human cognitive processes and brain activity (Dwivedi et al., 2021).

❖ DEPENDENT VARIABLE

• Intelligent Pedigree of Chinese Traditional Silk Pattern

One digital archive that illustrates how developments in AI, the preservation of cultural legacy, and innovative design driven change all come together is the "Intelligent Pedigree of Chinese Traditional Silk Pattern". The pinnacle of centuries of artistic expression and creative expertise in the world of textiles are the aesthetic sensitivities, historical tales, social symbols, and regional identities inherent in traditional Chinese silk designs. In the framework of this conversation, the idea of a "pedigree" derives from genealogical analogies. These allegories underline the value of lineage, heredity, and traceability. This family tree goes beyond the domain of static documentation by including intelligent technology; it becomes a flexible framework allowing the categorisation, analysis, manufacturing, and real-time reinterpretation of silk patterns. Chinese silk pattern production has a long history spanning both the hand-drawn designs and the oral knowledge transmission from master to apprentice. This immediately calls for the rehabilitation and preservation of this legacy using modern digital means. As such, the "intelligent pedigree" provides a forum for the evolution of fresh ideas as well as a storehouse of cultural legacy. Computational taxonomy of themes based on historical context, geographical origin, symbolic relevance, weaving techniques, and aesthetic preferences of the weaver is developed. AI-enabled system using data visualisation, NLP, picture identification, and ML achieves the development of new silk designs based on historical themes. It can also autonomously identify and grasp currently existing designs (Bray & Hahn, 2022).

• Relationship between Artificial Intelligence and Intelligent Pedigree of Chinese Traditional Silk Pattern

The use of AI into systems for cultural legacy has opened new opportunities for the recording, preservation, and enhancement of traditional art forms. This has given rise to fresh prospects. The creative expressions responsible for the development of a people's aesthetic and historical identity are those ones. One of the fields where AI has greatest future possibilities is the design of traditional Chinese textiles. Particularly among the areas in which this possibility is most exciting is the silk pattern lineage that reflects China's social, cultural, and philosophical past. This potential spans a wide spectrum of conceivable uses. Included in the continually growing digital database Intelligent Pedigree of Chinese classic Silk Pattern are both traditional and modern Chinese silk designs. It also offers means for analysis, classification, and the production of theme expressions. When taken in the framework of this discussion, AI is more than simply a tool; it is a methodological force powered by data that encourages innovation, creativity, and preservation by means of computational brilliance and insights. AI, the technical implementation of classic Chinese silk patterns, and the cultural relevance of these designs have a complicated relationship. Analysis of this connection is the aim of this part of the study (Chen & Wu, 2023).

On the basis of the above discussion, the researcher formulated the following hypothesis, which was analysed the relationship between Artificial Intelligence and Intelligent Pedigree of Chinese Traditional Silk Pattern.

“H₀₁: There is no significant relationship between Artificial Intelligence and Intelligent Pedigree of Chinese Traditional Silk Pattern.”

“H₁: There is a significant relationship between Artificial Intelligence and Intelligent Pedigree of Chinese Traditional Silk Pattern.”

Table 2: H₁ ANOVA

ANOVA					
Sum					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	79,943.245	263	303.967	63.419	0.000
Within Groups	1,845.318	385	4.793		
Total	81,788.563	648			

In this study, the result is significant. The value of F is 63.419, 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 Artificial Intelligence (AI) and Intelligent Pedigree of Chinese Traditional Silk Pattern”*** is accepted and the null hypothesis is rejected.

9. DISCUSSION

Driven by research into the intelligent lineage of ancient Chinese silk designs, this study into AI, innovation building, and other related subjects sought for answers. This study aimed to understand how innovation building functions as a mediator between AI-driven systems, tools, and frameworks and the organisation, categorisation, augmentation, and transfer of historical silk patterns. Statistical analysis was used to the data acquired from a structured questionnaire that was given to a sample chosen at random in order to provide evidence in support of hypotheses and to study further the relationships between the dimensions. The findings show that AI significantly influences the intelligent lineage of traditional silk designs as well as their evolution. When all the factors were considered, the participants agreed that AI technologies like automated classification, ML, and picture identification are beneficial in digitising, conserving, and inventing with silk history. These results, in accordance with earlier research, highlight the transforming power AI offers in the arts and entertainment sectors. The basic components of an intelligent pedigree system are geographic features, weaving techniques, and historical subjects. AI's capabilities in the domains of data visualisation, pattern detection, and metadata enrichment help one to classify these components. The answers to the poll helped to establish a consensus on the capacity of AI technologies to replicate and reinterpret already produced designs. This makes it feasible to combine modernism with preservation in a harmonic balance. Also, the growth of new technologies is a big component that affects how AI works with the results of algorithms that have been employed in the past. The adoption of new technologies sped up the process of turning unstructured data into organised information, as the study showed. This comprehensive study of the use of AI in the

production and conservation of traditional textiles includes frameworks, infrastructure, and collaborative methodologies, among other subjects. The statistical study conducted produced data indicating a substantial association between the respondents' evaluations of the quality of the inventive development and the role of AI. This indicates that AI have technical capabilities; yet, it is the deliberate and creative use of these capabilities via innovation that enables significant contributions to the cultural legacy we bequeath. Under the parameters of this study, indicators like multidisciplinary cooperation, system development, and creative design thinking helped to operationalise innovation building. The results clearly show that the possible contribution of AI to the preservation of historic sites runs the risk of being underdeveloped in the lack of organised innovative methods.

10. CONCLUSION

In conclusion, this research investigated how AI contributes to the development of the intelligent lineage of traditional Chinese silk patterns, which is a relatively recent innovation. The dependent variable in this study was the intelligent ancestry of the traditional Chinese silk design, and the innovative construction variable functioned as the mediating variable. The quantitative technique used in this research made it possible to conduct an objective assessment of the link that exists between these three dimensions. AI must be a key part of the process of building a digital framework that is not only well-structured and well-planned but also always evolving. The research study that was done led to this conclusion, and the results of that study were used to support it. For this reason, it is possible to save, identify, and even copy extremely antique silk patterns from China. After carefully looking at the answers to a structured questionnaire given to people who worked in silk design, cultural preservation, historical research, and technical innovation, it was decided that this result was the result of a thorough evaluation. Use of AI would be beneficial for improvement of innovation capabilities of traditional silk pattern. Additionally, the most recent technical developments, such pattern recognition, generative design, digital archiving, and automated categorisation can be also beneficial. AI can assess historical data to find patterns in trends and develop new ideas that are both culturally authentic and in line with current fashion. In conclusion, strategies such as machine learning algorithms (MLAs), smart databases, and computer vision technologies for innovation construction activities of traditional silk pattern. Because of these traits, a new notion has emerged throughout the investigation, and it is called the "intelligent pedigree." These are silk designs that change all the time yet nevertheless stay true to their historical roots. The project is still being worked on, and the information that is being gained right now is what is helping it go forward.

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