

Artificial Intelligence Empowerment in the Cultural Heritage Transmission of Guangdong's Maritime Silk Road

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Abstract: This study examined the current state of cultural heritage and the innovative application of artificial intelligence (AI) in the transmission of Guangdong's Maritime Silk Road culture. Employing methods such as literature analysis, field research, and action research, the study explored key areas including the present status of cultural transmission, the semiotic characteristics of Maritime Silk Road culture, the development of a cultural corpus and knowledge graph, and the application of AI technologies. The study introduced several innovations, including interdisciplinary integration, the fusion of technology and culture, and the integration of industry, academia, and research. These efforts aim to offer new pathways for the transmission of Maritime Silk Road culture, contributing to the preservation and development of cultural heritage.

Keywords: Guangdong Maritime Silk Road; Cultural heritage; Cultural transmission; Artificial intelligence; Interdisciplinary integration

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1. Introduction

The integration of artificial intelligence (AI) into the cultural industry has presented new opportunities for the preservation and innovative development of the Maritime Silk Road's (MSR) cultural heritage. AI technology, as a core driver of new productivity, is accelerating advancements, propelling the cultural industry into a transformative "intelligent+" era. This shift is also sparking profound changes in research paradigms. How to leverage AI to enhance cultural heritage preservation and foster technological innovation in the cultural and creative industries while aligning with the goals of MSR heritage preservation and innovation is a pressing research challenge. Exploring new practices in digitally driven cultural preservation, production, dissemination, and consumption requires urgent attention.

The current state of MSR cultural research in China is characterized by both progress and challenges.

Challenges include an abstract and ambiguous understanding of the heritage's value, limited symbolic recognition, and insufficient dissemination and influence. Key issues include defining the concept of MSR cultural heritage, integrating heritage resources, constructing a knowledge system for MSR cultural preservation, and establishing effective mechanisms and platforms for dissemination.

2. Research status and development trends

2.1. Research on the cultural heritage of the Maritime Silk Road

As a vital conduit for ancient economic and cultural exchanges between China and the world, the Maritime Silk Road holds significant importance for understanding historical Sino-foreign cultural exchanges, maritime trade history, and the contemporary Belt and Road Initiative (BRI). In recent years, scholars in China and abroad have conducted extensive research on the cultural heritage of the MSR, encompassing historical verification, heritage preservation, and cultural exchange and dissemination.

Many researchers, using methods such as archaeological excavation and textual analysis, have explored the formation, development, and historical influence of the MSR during different periods^[1]. These studies have revealed the MSR's critical role in cultural exchanges between China and the world, such as the evolution of trade routes and the rise and fall of port cities^[2]. Researchers have also focused on the preservation of cultural heritage along the MSR, proposing strategies that include the protection of tangible and intangible cultural heritage^[3-5]. These studies highlight the importance of preservation in promoting cultural identity and economic development. Research on cultural exchanges along the MSR explores various aspects, such as religion, art, and language, exploring the interactions and integration of cultures within the MSR context.

However, the long history of the MSR has resulted in the loss or destruction of many historical records, leading to incomplete research materials and posing challenges for scholars. Although many preservation measures have been proposed, cultural heritage protection along the MSR faces challenges in implementation, including the conflict between development and preservation.

Future research can focus on the following. First, enhancing data collection and organization, such as further gathering and compiling historical documents and archaeological materials related to the MSR to fill existing gaps. Second, advancing interdisciplinary research, including semiotics, linguistics, cultural anthropology, history, archaeology, and geography, to enrich and deepen the understanding of MSR cultural heritage. Third, utilizing modern technological methods, such as AI, remote sensing, GIS, and 3D modeling, to improve the precision and scope of research. Fourth, strengthening policies and their implementation to protect MSR cultural heritage, striking a balance between economic development and cultural preservation.

2.2. Research on AI in cultural heritage preservation and innovation

In recent years, driven by technological advancements and policy initiatives, countries worldwide have intensified research efforts on the application of AI in cultural heritage preservation and innovation. Many nations have introduced policies encouraging the integration of AI into cultural industries, fostering cultural heritage preservation and innovation. This has led to the establishment of preliminary theoretical frameworks and application models, the development of representative intelligent cultural products and services, and the achievement of notable social and economic benefits.

In China, research emphasizes the digitization and preservation of intangible cultural heritage, intelligent

cultural service platforms, and the intelligent creation and recommendation of cultural products^[6-9]. For instance, AI technologies such as image recognition and natural language processing are applied to digitize and recreate intangible cultural heritage, ensuring its preservation and transmission. Intelligent cultural service platforms, such as the Intelligent Cultural Cloud Landmark project, leverage big data and AI to improve the efficiency and quality of public cultural services, promoting the sharing and dissemination of cultural resources. AI is also utilized in the intelligent creation and recommendation of cultural products, such as AI-generated poetry and paintings, fostering innovation and diversity in cultural products.

The main perspectives in the literature focus on technological empowerment, integrated development, and protection and transmission. In terms of technological empowerment, AI technologies such as deep learning, computer vision, and natural language processing provide new tools and methods for the cultural industry, driving innovation and development in cultural content. Regarding integrated development, the deep integration of AI and the cultural industry not only enhances the efficiency and quality of cultural product production but also creates new modes and experiences for cultural consumption, promoting the transformation and upgrading of the cultural industry. In the domain of protection and transmission, AI plays a vital role in the digital preservation and innovative design of intangible cultural heritage. AI technologies enable more precise interpretation and presentation of intangible cultural heritage, improving its preservation and dissemination outcomes.

Future research can strengthen interdisciplinary studies, enhancing the integration of AI technologies with cultural studies to explore more innovative applications and practices. It is also essential to establish and improve relevant legal and ethical frameworks to ensure the healthy and orderly development of AI applications in the cultural industry. Additionally, research should deepen the application of technologies such as VR and AR in cultural transmission. Finally, institutional innovations should be advanced to adapt to the rapid development of AI technologies, providing robust support for the sustainable development of the cultural industry.

3. Research methods

3.1. Literature analysis method

A systematic review and analysis of existing literature and materials was conducted to understand the current state of research, key issues, and methods related to the cultural heritage and transmission of Guangdong's Maritime Silk Road. The study systematically organized theoretical achievements in disciplines such as semiotics, linguistics, and cultural anthropology, providing theoretical support for subsequent research methods and technologies. Domestic and international cases of AI applications in cultural transmission were analyzed to offer experiential references for the cultural preservation and innovative development of Guangdong's Maritime Silk Road.

3.2. Field research

Field research involved site visits, observations, and interviews to gather information and data related to the cultural transmission of Guangdong's Maritime Silk Road. This included on-site investigations of related sites, artifacts, and cultural landmarks to understand their current status and protection conditions. Collaborations with enterprises, such as through partnerships with schools or alumni entrepreneurs, the research project provided opportunities to visit companies or interview relevant personnel to learn about projects related to the cultural transmission of the Maritime Silk Road, collecting data for research.

Local experts in related fields were consulted to obtain technical support for the project. Interviews with local residents were conducted to understand their perceptions, attitudes, and needs regarding the cultural transmission of the Maritime Silk Road. Questionnaires and interviews were also used to explore university students' awareness, attitudes, and engagement in innovative practices related to the Maritime Silk Road, collecting relevant data for analysis.

3.3. Empirical research

Empirical research involved the construction and application of a Maritime Silk Road cultural corpus, a Guangdong Maritime Silk Road cultural knowledge graph, and the comprehensive application of generative AI to validate the value of AI in cultural transmission and innovation for the Maritime Silk Road in Guangdong. This research provided new approaches and models for the protection, transmission, and innovation of traditional culture, fostering deeper integration between technology and cultural heritage.

3.4. Action research

Action research is a participatory research method where researchers collaborate with participants to jointly develop and implement solutions to problems, continuously reflecting on, revising, and refining plans and methods during the process. Action research was employed to validate and refine application plans for generative AI, knowledge graphs, and corpora in cultural transmission through on-site collaboration and practice. Action research was also used to collaborate with university students, Guangdong-based enterprises, local communities, and cultural institutions to jointly develop action plans for the transmission of Maritime Silk Road culture.

4. Research pathways

4.1. Analysis of the current state of Maritime Silk Road cultural transmission in Guangdong

This involved a systematic investigation of the cultural heritage of Guangdong's Maritime Silk Road, including historical documents, sites, artifacts, and oral histories, to collect and organize relevant materials. Key challenges in the transmission of Guangdong's Maritime Silk Road culture were analyzed, such as difficulties in protecting cultural heritage, low public awareness, and insufficient international influence. Strategies were explored to leverage AI technologies and global trends to enhance the transmission and innovation of Guangdong's Maritime Silk Road culture.

4.2. Analysis of semiotic features of Maritime Silk Road culture in Guangdong

Theoretical achievements from disciplines such as semiotics, linguistics, and cultural anthropology were integrated and applied to the study of cultural transmission of the Maritime Silk Road. This included identifying and analyzing the symbols within Maritime Silk Road culture to examine their representative elements, symbolic meanings, and cultural connotations, such as Zheng He, Mazu, lion dances, literary works, and trade goods. The analysis explored how the cultural symbols of the Maritime Silk Road reflect characteristics of society, religion, economy, and art, as well as their roles and impacts in cross-cultural exchanges. The semiotic features of Guangdong's Maritime Silk Road culture were examined to propose strategies for addressing issues such as ambiguous heritage value and insufficient dissemination and influence of Maritime Silk Road culture.

4.3. Construction and application of a Maritime Silk Road cultural corpus

Based on linguistic theories, historical documents, oral histories, and multimedia materials related to Maritime Silk Road culture were collected and organized to build a high-quality cultural corpus. Natural language processing (NLP) technologies, such as generative AI, were applied to process and analyze textual data in the corpus, including tasks like tokenization, part-of-speech tagging, named entity recognition, and sentiment analysis. Efforts were also made to establish an open corpus platform to facilitate collaboration and data sharing between academic institutions and enterprises, providing robust data support for research on Maritime Silk Road culture.

4.4. Construction and application of a knowledge graph for Guangdong Maritime Silk Road culture

Drawing on the knowledge graph theory and technology, information on the Maritime Silk Road culture was structured and processed to build a comprehensive knowledge graph. This graph revealed the relationships between cultural heritage, historical events, and notable figures. A preliminary intelligent search and question-answering system based on the knowledge graph was developed to provide accurate information retrieval and query services related to Maritime Silk Road culture, enhancing user experience. Semantic analysis and knowledge inference using the knowledge graph support complex cultural research and data mining endeavors.

4.5. Research on the application of artificial intelligence in cultural transmission

A review of relevant research outcomes, both domestic and international, was conducted to analyze classic success cases of AI empowering cultural transmission, providing experiential references for the transmission of Guangdong's Maritime Silk Road culture. For example, artificial intelligence can process and analyze vast amounts of cultural data, including historical documents, oral histories, and archaeological data, facilitating the study of Guangdong's Maritime Silk Road cultural transmission. Through AI technologies, cultural heritage can be digitized and managed intelligently, enabling the creation of virtual museums and digital archives to achieve the protection and transmission of cultural heritage. AI can also support the development of intelligent retrieval systems and interactive display platforms, allowing the public and researchers to conveniently access and understand cultural information about Guangdong's Maritime Silk Road.

5. Research innovations

5.1. A new perspective: Interdisciplinary integration

This research adopted an interdisciplinary methodology, integrating theoretical achievements from linguistics, semiotics, cultural anthropology, and artificial intelligence to study the transmission and innovation of Guangdong's Maritime Silk Road culture. This new perspective aided in the discovery, protection, and organization of indigenous and heterogeneous maritime cultures. It facilitated a deeper understanding of the characteristics of Guangdong's Maritime Silk Road culture, the history and status of cultural exchange and integration, and the development of cultural industries. Furthermore, it joined the effort to accelerate the digitization, preservation, and dissemination of cultural materials, providing a foundational study for the advancement of the cultural and creative industries in the "intelligent+" era.

5.2. A new model: Integration of technology and cultural transmission

While research on Maritime Silk Road culture has gained considerable attention and studies on artificial

intelligence in cultural innovation are flourishing, there is a lack of literature examining whether AI can optimize the transmission and innovation of Maritime Silk Road culture. By constructing and applying a Maritime Silk Road cultural corpus, a knowledge graph for Guangdong's Maritime Silk Road culture, and integrating generative AI applications, this research validated the value of AI in the transmission and innovation of Guangdong's Maritime Silk Road culture, providing new pathways and models for the protection, transmission, and innovation of traditional culture, and promoting deep integration of technology and cultural transmission.

5.3. New data: Integration of industry, academia, and research

Few studies have focused on the integration of industry, academia, and research in the transmission of Maritime Silk Road culture, and even fewer address the application of artificial intelligence in this context. By building and applying a Maritime Silk Road cultural corpus and a knowledge graph for Guangdong's Maritime Silk Road culture, this research provided new data and case studies to support the practices of industry-academia cooperation, integration of education with industry, and the synergy of science and education. Additionally, the research explored the development of Maritime Silk Road cultural projects and the translation of research outcomes, participating in serving the construction of local cultural industry parks and promoting the intellectual property development of cultural products.

6. Conclusion

An interdisciplinary perspective offers valuable insights for an in-depth analysis of the cultural transmission of Guangdong's Maritime Silk Road. By employing diverse research methods, this study examined the current state of transmission, identified semiotic characteristics, constructed a corpus and knowledge graph, and investigated AI applications. The innovative contributions lie in providing new perspectives, models, and data for cultural transmission, promoting the integration of technology and culture, and advancing the integration of industry, academia, and research. Future research can continue to deepen these efforts, fully leveraging AI's role in Maritime Silk Road cultural transmission, strengthening collaboration among stakeholders, and enabling the vibrant rejuvenation of Maritime Silk Road culture in the new era.

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The author declares no conflict of interest.

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