Research on the Pathways and Practice for Collaborative Inheritance of AI-Empowered Traditional Culture in Chinese Opera Art

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ABSTRACT

Against the dual backdrop of diversified modern entertainment and the dilemma of traditional opera inheritance, AI technology provides a new solution for the dynamic inheritance and innovative development of opera art. With the theme of "AI empowering traditional culture to pass on traditional opera art in coordination", starting from the current situation of opera inheritance, this paper systematically analyzes the application path of AI technology in the four dimensions of opera resource protection, talent training, creative innovation and dissemination, expounds the implementation basis of the project relying on university scientific research platform and interdisciplinary teams, and finally puts forward the project achievements and future vision, providing practical reference for the deep integration of traditional culture and modern science and technology.

Keywords: AI technology, Inheritance of traditional Chinese opera, Digital protection, Innovation path, Practice in colleges and universities.

1. INTRODUCTION

As an important carrier of excellent traditional Chinese culture, opera carries the national cultural genes and aesthetic paradigms. However, its inheritance faces practical challenges such as aging audiences, talent loss, and lagging creativity in contemporary times. With the deep penetration of artificial intelligence technology in the cultural field, the integration of AI and traditional Chinese opera has moved from concept to practice - from Tencent's "Digital Renewal of Chinese Opera Action" image restoration to Stanford University's "Hamlet. AI" drama experiment, technology injects new vitality into traditional art. Jiujiang University relies on platforms such as the "Qingyang Opera Art Center" and the "Jiangxi Intangible Cultural Heritage Research Base" to explore the localization practice path of AI empowering opera inheritance, which has both academic value and practical significance.

2. THE CURRENT SITUATION, DIFFICULTIES, AND TECHNOLOGICAL OPPORTUNITIES OF CONTEMPORARY TRADITIONAL CHINESE OPERA INHERITANCE

2.1 Realistic Bottlenecks in the Inheritance of Traditional Chinese Opera

The current inheritance of traditional Chinese opera faces many difficulties and challenges. Firstly, there is a gap in the audience group, with young people lacking interest due to diverse entertainment choices and a high aesthetic threshold for traditional Chinese opera. The core audience is mainly middle-aged and elderly people, resulting in a generational transmission gap; Secondly, talent cultivation is difficult, as opera actors require 5-10 years of professional training, with a long training period and low industry remuneration, leading to serious talent loss; Thirdly, there is a lack of creativity and innovation, with some scripts limited to traditional themes and disconnected from

contemporary life, resulting in a shortage of excellent screenwriters; Fourthly, there is insufficient protection and dissemination of resources, with a large amount of traditional Chinese opera images, scores, and other materials not digitized. Offline performances are limited by time and space, and the channels for dissemination are single.

2.2 Technological Opportunities Empowered by AI in Traditional Chinese Opera

The development of AI technology provides key support for solving the above-mentioned difficulties. At the level of resource conservation, AI can achieve digital collection and restoration of opera materials, such as classifying and archiving costumes and facial makeup through image recognition, and reproducing endangered singing styles using speech synthesis technology; At the level of creative innovation, natural language processing models can assist in generating script outlines, while recurrent neural networks can intelligently create opera melodies; At the level of dissemination and promotion, recommendation algorithms can accurately push opera content, while VR/AR technology creates an immersive viewing experience; At the level of talent cultivation, virtual rehearsal systems can provide learners with real-time guidance on movements and singing styles, reducing teaching costs. These technological advantages have opened up a new track of "technology + art" for the inheritance of traditional Chinese opera.

3. THE CORE IMPLEMENTATION PATH OF AI EMPOWERING THE INHERITANCE OF TRADITIONAL CHINESE OPERA

Based on project practice planning and early technical accumulation, AI empowerment of opera inheritance can be promoted through the "four in one" path, achieving full chain coverage from resource protection to dynamic inheritance.

3.1 Resource Protection Path: Building a Digital Resource Library for Traditional Chinese Opera

Based on the existing traditional Chinese opera resources of Jiujiang University, the project first carries out multi-source data collection, covering four categories: text (script, score, drama review), audio (singing style, instrument performance), video (stage performance, teaching demonstration), and images (costumes, masks, props). The authors obtained public data through web crawlers and collaborated with institutions such as Hukou County Qingyang Opera Inheritance Center and Jiangxi Provincial Museum to obtain valuable first-hand information. We have planned to collect over 5,000 hours of information on local opera genres such as Gan Opera, Qingyang Opera, and Xihe Opera.

After data collection, AI technology is used for standardization processing: text data is segmented and part of speech tagging is used to construct a specialized Chinese opera lexicon; Audio data is enhanced with noise reduction and format conversion techniques to improve sound quality; Marking key points of actors' actions and expressions in video data; The image data is denoised and normalized to ensure consistency. Ultimately, a cloud based digital resource library for traditional Chinese opera will be established to achieve resource classification retrieval, online preview, and sharing, providing basic support for subsequent AI model training and opera research.

3.2 Talent Cultivation Path: Developing AI-assisted Teaching System

In response to the problem of low efficiency and limited resources in traditional Chinese opera teaching through oral transmission, the project develops an AI assisted teaching system, which includes two core modules: The first is the "virtual rehearsal field", which uses motion capture technology to construct a three-dimensional virtual stage. Students can simulate classic opera performances, and AI corrects body movements in real time through posture estimation technology. Combined with speech recognition analysis of singing pitch accuracy and rhythm, personalized improvement suggestions are generated; The second is an "intelligent learning library" that integrates course resources such as "Qingyang Opera Performance Major", and pushes suitable teaching videos and practice tracks based on students' learning progress. For example, it recommends basic singing training for beginners and provides expert performance data analysis for professional actors.

In addition, the system will also be integrated with the curriculum system of the Art Institute of Jiujiang University, providing practical support for

courses such as "Ethnic Folk Music" and "Introduction to Art", cultivating compound talents who understand both opera art and AI technology, and alleviating the shortage of talents in the industry.

3.3 Creative Innovation Path: Developing AI Assisted Creation and Stage Presentation System

At the creative level, the project is developing an AI assisted creative system that integrates "script + music + stage design". The script creation module adopts the Transformer architecture. By learning classic texts such as "Peony Pavilion" and "Romance of the Western Chamber", it can generate a script outline and initial lyrics based on user input themes (such as "rural revitalization") and character settings. For example, it can create a modern theme script "New Voice of the Ancient Ferry" based on the Huangmei Opera style; The music creation module uses recurrent neural networks to generate melodies that are adapted to the script plot and character emotions, supporting the switching of local opera styles such as Gan Opera and Qingyang Opera; The stage design module recognizes classic opera scene elements through computer vision, automatically generates stage scenery schemes, and reduces the threshold for creation.

At the stage presentation level, the project explores the integration mode of "virtual + reality": on the one hand, it is necessary to use motion capture technology to create virtual digital characters for opera, reproduce the performance styles of famous artists such as Mei Lanfang, or create virtual characters to perform on the same stage as real actors; On the other hand, by combining holographic projection and AI scene generation technology, it can achieve real-time switching of stage scenes, such as transforming the "courtyard" scene in traditional Chinese opera into an immersive landscape atmosphere, breaking through the limitations of physical stages.

3.4 Promotion Path: Building an AI-driven Platform for Traditional Chinese Opera Communication

To expand the audience of traditional Chinese opera, the project will build an AI platform for opera dissemination, focusing on three major functions: firstly, personalized recommendation. By analyzing user browsing history, likes and comments data, it will accurately push opera clips and performance previews. For example, it will push opera costume short videos to young users and classic opera restoration versions to middle-aged and elderly users; The second is interactive experience, developing a "opera face fusion" mini program, where users can generate opera character images by uploading photos, stimulating social sharing and dissemination; The third is online live streaming, using AI image restoration technology to optimize the quality of traditional opera live streaming, combined with real-time barrage interaction to enhance audience participation.

The platform also plans to cooperate with Tiktok, Station B and other short video platforms to produce series of content such as "AI repair classic opera" and "virtual corner aria". It is estimated that the annual exposure will exceed 10 million times, attracting young people to pay attention to opera culture.

4. FOUNDATION AND IMPLEMENTATION PATH OF PROJECT IMPLEMENTATION

4.1 Project Implementation Fundamentals

In terms of society, national strategy and local support are mutually driven. The "14th Five-Year Plan" for cultural development clearly proposes to "promote the deep integration of traditional culture and modern technology", and include AI + intangible cultural heritage as a key support area; Local governments have actively responded, such as the establishment of a special fund for intangible cultural heritage protection by the Jiangxi Provincial Department of Culture and Tourism, to support the digital inheritance projects of local opera genres such as Qingyang Opera and Xihe Opera.

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In terms of universities, Jiujiang University has made many efforts in the inheritance and development of traditional Chinese opera. The Art Institute at Jiujiang University has established the "Jiangxi Intangible Cultural Heritage Jiujiang University Research Base", which houses a large collection of opera related materials such as Qingyang Opera. It has also included "Hukou Qingyang Opera" and "Wuning Drum Song" in its curriculum training plan, allowing students to learn

theoretical knowledge of intangible cultural heritage through professional teaching and cultivate relevant protection workers. At the same time, with the support of the Provincial Department of Culture and Tourism and the Jiujiang Municipal Bureau of Culture, Radio, Film, and Tourism, the development of local intangible cultural heritage is promoted through training courses for inheritors of intangible cultural heritage. For example, in 2023, students of the Chinese Intangible Cultural Heritage Inheritors (Xingzi Xihe Opera) training course participated in the results exhibition of the 2024 Jiangxi Province Intangible Cultural Heritage and Tourism Integration Development Week.

4.2 Implementation Path

Firstly, it is to do a good job in protecting, inheriting, and promoting traditional Chinese opera. On October 11, 2025, Jiujiang University held a "Training Class for Inheritors of Chinese Intangible Cultural Heritage Xiushui Ninghe Opera" at the Art College of Jiujiang University.("Figure 1" and "Figure 2") The class aims to cultivate students' learning of intangible cultural heritage Ninghe Opera while organizing multiple performances to promote it, allowing more young people to experience and understand the charm of Ninghe Opera. At the same time, this activity also plays a role in inheriting and promoting it. Previously, Jiujiang University also conducted training courses for inheritors of intangible cultural heritage such as Qingyang Opera and Drum Song, making significant contributions to the inheritance and development of intangible cultural heritage in Jiangxi Province.

Figure 1 Speech by President Cha at the opening ceremony of the Ninghe opera inheritance training class at the Art Institute of Jiujiang University in 2025.

Figure 2 Performance at the opening ceremony of the Ninghe opera inheritance training class at the Art Institute of Jiujiang University in 2025.

Secondly, AI empowerment opens up a new platform for opera. AI opera is introduced into the classroom. In courses such as "Introduction to Art" and "Folk Music" offered by the Art Institute of Jiujiang University, AI is combined with opera for teaching. For example, students use AI to create the Huangmei opera song "Farewell on the Ancient Ferry", which effectively utilizes the characteristics of AI and Huangmei opera to showcase the charm of opera. At the same time, in the training class for inheritors of Ninghe Opera, the teacher combined AI with traditional Chinese opera to teach students a new look of Ninghe Opera, enabling inheritors to better learn and integrate AI with Ninghe Opera in the future inheritance of Ninghe Opera, opening up new paths for the inheritance of Ninghe Opera and creating new paths for the inheritance of intangible cultural heritage.

Finally, it is believed that with the powerful empowerment of AI, the opera inheritance project will reshape the development pattern of opera art in the future and create diverse values. In terms of performance, it is hoped to see a new combination of opera and AI, using VR to allow more people to see the charm of opera. In terms of innovation, AI opera software will be seen to provide better creative conditions for opera creators, while also allowing them to listen to pleasant music that combines opera and modernity. In terms of education, students can better learn traditional Chinese opera through AI, so that opera no longer stays on paper, but adds visual and auditory effects, helping students to have a deeper understanding of the characteristics of opera and better inherit China's intangible cultural heritage opera. In terms of resources, creating more opera resource libraries

can better preserve opera resources and more types of opera through AI, and better protect endangered intangible cultural heritage opera.

5. CONCLUSION

AI technology provides a new solution for the inheritance of traditional Chinese opera, but its essence is "tool empowerment" rather than "replacing art". In the process of project implementation, it is necessary to always adhere to the principle of "technology serving art", and through deep collaboration between AI experts and opera artists, avoid technology applications becoming mere formalities. The practice of Jiujiang University has shown that as the core battlefield for talent cultivation and scientific research innovation, universities can provide key support for the integration of traditional culture and modern technology. In the future, it is necessary to further strengthen policy support, interdisciplinary cooperation, and social participation, so that AI can truly become a "booster" for the inheritance of traditional Chinese opera, and enable ancient opera to shine with new brilliance in the new era.

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