



# Artificial Intelligence Boosting Protection and Communication of Intangible Cultural Heritage

Ming Zhao and Jiyuan Cui(✉)

School of Design and Art, Shenyang Jianzhu University, Shenyang 110168, Liaoning, China  
zhaom0430@163.com

**Abstract.** As one of the forms of traditional culture passed down from generation to generation and closely related to people's life, intangible cultural heritage is a reflection of the existence and development of human folk culture and human life style, and it is also a very important link in the protection of traditional culture. However, as a relatively special cultural carrier, intangible cultural heritage, especially the soil where most of the intangible cultural heritage projects in my country are produced and developed are based on farming civilization, with collective creation, word of mouth, hand-made, and technological evolution. Slowness and other characteristics. In view of this, it is also an important means to promote the effective protection and communication of intangible cultural heritage in the new era via making the intangible cultural heritage "alive and moving". In this regard, the engagement of cloud computing, artificial intelligence and other big data analysis technologies can, on the one hand, realize the innovation of intangible cultural heritage protection, and on the other hand, facilitate the diversification of the communication methods of intangible cultural heritage.

**Keywords:** Artificial Intelligence · Intangible Cultural Heritage · Living Communication

## 1 Introduction

This article will discuss how to use artificial intelligence technology to help the protection and spread of intangible cultural heritage from the perspective of protecting intangible cultural heritage. The following article will introduce the possibility of artificial intelligence for intangible heritage protection and dissemination in the new era, and the application of artificial intelligence technology in intangible cultural heritage protection and dissemination today.

## 2 Development of Artificial Intelligence

### 2.1 Overview of Artificial Intelligence

Artificial intelligence technology (AI), refers to the intellectual behaviors made by humans, including perception, reasoning, learning, communication, and behavior in

complex environments, which aims to create machines that can perform these behaviors as well as or better than humans in the long term. Artificial intelligence is essentially a comprehensive use of computer technology, simulation technology, image technology, language technology, network technology, multimedia technology, data technology, virtual reality technology to help the simulation of human intelligence activities, so as to effectively integrate science, philosophy, art and other disciplines. The emergence and development of artificial intelligence is a long process. As early as hundreds of years ago, people began to imagine smart tools. Many countries, including China, can find visions and descriptions of smart tools in their literary works. The development of modern artificial intelligence technology provides some ideas and inspiration. Artificial intelligence has undergone changes in mechanical automation, electronic automation, and information automation. At present, the development of artificial intelligence is mainly stuck in the stage where the program can only passively accept information and requirements. In the future, it will strive to learn the way of thinking and behavior of human beings with itself as the main body and realize independent development and exploration [2]. The emergence of artificial intelligence has effectively liberated the intelligence and physical strength of human beings, strengthened the dialogue between human and intelligent machines, and provided effective support for the sustainable development of human civilization.

## 2.2 The Development of AI in China

With the attention of national policies and the development of 5G and other related basic technologies, China's artificial intelligence industry has seen explosive and rapid growth driven by the joint efforts of various fields, with huge market development potential. According to the data, as shown in Fig. 1, the scale of China's artificial intelligence core industry has exceeded 51 billion yuan in 2019 and is expected to reach 400 billion yuan in 2025. The future development is expected to be the world's largest AI market.

At present, speech recognition and natural language processing in China's artificial intelligence technology have been widely used in various fields such as finance, education, and transportation. Based on the penetration degree and market size of each segment, as shown in Fig. 2, AI has the largest market size in the manufacturing sector and the highest maturity in the security, retail and financial sectors. There is still great room for development in medical treatment, agriculture, culture and entertainment. With the empowerment of 5G and other emerging technologies, the scope of future artificial

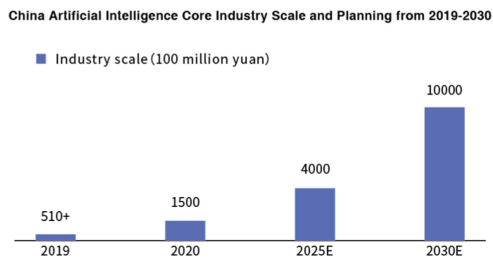
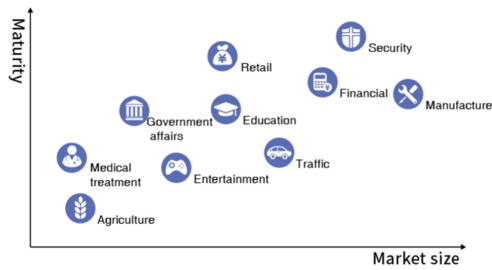


Fig. 1. Scale and planning of China's AI core industries from 2019 to 2030

The Maturity of Each Artificial Intelligence Technology Application Segment in 2020



**Fig. 2.** Development maturity of various application fields of artificial intelligence technology in 2020

intelligence application scenarios will continue to expand and penetrate deeply into various fields.

Simultaneously, artificial intelligence is also beginning to play an important role in the current protection and dissemination of cultural heritage. In recent years, combined with big data, 5G network environment and 8K display technology, digital cultural heritage relies on artificial intelligence to transform, reproduce and restore cultural heritage into shareable and renewable digital form, comprehensively enabling and effectively transforming cultural heritage into productive forces. However, compared with material cultural heritage, the application of intangible cultural heritage in artificial intelligence technology is still relatively weak. General Secretary Xi Jinping specifically pointed out: “We must be good at organically unifying the promotion of excellent traditional culture and the development of real culture.” How to organically combine science and technology with excellent traditional culture and develop in inheritance is a key research field. During the two sessions in 2019, General Secretary Li Keqiang included artificial intelligence in the government work report for the third time, putting forward the important concept of “intelligence plus” for the first time, and it was highlighted in a separate paragraph, demonstrating the determination and confidence to promote the AI strategy at the national level. The organic combination of “intelligence + intangible cultural heritage” will make the intangible cultural heritage and its unique charm better spread.

### 3 Dilemma and Opportunity of Intangible Cultural Heritage in the Age of Intelligent Media

#### 3.1 Difficulty of Protection and Communication of Intangible Cultural Heritage

Intangible cultural heritage is a concept put forward relative to tangible cultural heritage. It is the crystallization of the wisdom of human civilization and an important testimony to a nation’s long history and brilliant civilization. The protection and inheritance of intangible cultural heritage is an important indicator of the level of human development. However, China started late in the protection of intangible cultural heritage, lack of experience and inadequate measures, and many precious intangible cultural heritages

have been lost, and some of them are in an embarrassing situation of being on the verge of extinction. Although the State Council has also issued relevant document policies, it is easy to awaken the public's awareness of intangible cultural heritage protection, but there are practical difficulties in implementation.

The geographical environment is limited, the spread range is small, and the protection is difficult: The most distinctive characteristics of intangible cultural heritage lie in its regionalism, nationality and history, and it is the spiritual carrier of different national cultures and life and production modes. Due to the accelerating process of urbanization in China, most of the intangible cultural heritages are basically in rural areas or more remote areas. In addition, most of the young generation now choose to go out for development, so there are fewer fresh forces for the inheritance and development of intangible cultural heritage. Secondly, limited by the geographical environment, few people know about the intangible cultural heritage in other areas, which has a great restriction on its protection and dissemination.

- 1) *Caught in the predicament of "museum style" static communication:* Most of China's intangible cultural heritages originated from the farming civilization. With the rapid development of modern society and economy, the connection between people and intangible cultural heritage is gradually weakened and gradually separated from daily life. As intangible cultural heritage is usually inherited through oral and technical communication, the communication process is full of limitations and uncertainties. For example, Turdi Ahonshi, an old artist of Twelve Muqam in Xinjiang, could not sing the Twelve Muqam "long song" completely. His death was a great loss to Twelve Muqam singing. At present, the main protection measures for intangible cultural heritage are to preserve relevant contents in museums in the form of static text description and object display through the intervention of relevant departments such as the government. This makes the intangible cultural heritage in the dissemination of small intensity, regional limitations and other "museum" static communication predicament.
- 2) *The application of smart media technology is insufficient, and the target of communication is missing:* At present, in the protection and dissemination of intangible cultural heritage in China, the tools and technologies of intelligent media have not been fully used. Mostly, the relevant management departments and public welfare social organizations set up websites to disseminate information. These single text or static pictures lack of interactive and personalized services. In addition, the contemporary young people are in an era of intelligent media, and the lack of application of relevant communication tools and technologies will also lead to the lack of interest and attention of the young generation in intangible cultural heritage.
- 3) *The content of communication is single and lack of innovation:* At present, most of the content presented on the intangible cultural heritage-related websites is the basic introduction of the intangible cultural heritage. The reports on the intangible cultural heritage on the websites are lack of depth and innovation, and most of them are the same words, pictures and videos. Therefore, rigid, monotonous, lack of innovation of the content is difficult to arouse the interest of the younger generation in-depth understanding.

### 3.2 How to Make Intangible Cultural Heritage “Live” in the New Era

Big data technology should be used to establish the knowledge base of intangible cultural heritage and realize the digital management system: In view of the wide variety of intangible cultural heritages, digitizing intangible cultural heritages and establishing a large and detailed database by categories are necessary measures for effective protection and inheritance of intangible cultural heritages. On the one hand, the intangible cultural heritage can be completely preserved and digitally archived across time and space, so as to avoid the situation that the intangible cultural heritage has no successor due to traditional inheritance forms such as word-of-mouth transmission. On the other hand, it is also convenient for users to access relevant intangible cultural heritage information anytime and anywhere, which is conducive to enhancing people’s full understanding of the intangible cultural heritage.

- 1) *Internet as the leading, interactive live communication*: The interactive characteristics of the Internet can deepen the interactive experience between users and the intangible cultural heritage platform, making users’ receiving of intangible cultural heritage information turn from passive to active, so that they can explore and innovate more possibly [4]. Internet technology can give full play to the advantages of diversity of intangible cultural heritage, strengthen the connection between people and intangible cultural heritage, make it into people’s vision, into people’s life, so as to provide a broader space for innovation and development of intangible cultural heritage.
- 2) *AI technology should be used to enhance the digital transmission capacity of intangible cultural heritage*: It is time to integrate AI technology into the transmission process of intangible cultural heritage, better disseminate the intangible cultural heritage through scientific and technological means, and realize the digitization, information, networking and intelligence of the transmission of intangible cultural heritage. With the help of artificial intelligence and big data analysis, the dissemination and transformation of intangible cultural heritage can be realized in a larger scope, and the value of digitization of intangible cultural heritage can be enhanced and broadened, so that more people have the opportunity to have an in-depth understanding of the intangible cultural heritage [5]. At the same time, the continuous development of neural network and deep learning AI technology provides more application scenarios for intangible cultural heritage. For example, with the help of AI and virtual reality technology, the scene of intangible cultural heritage is restored from multiple dimensions and perspectives, so that users can have a more intuitive and in-depth understanding of the cultural deposits and historical connotations behind the intangible cultural heritage when they contact it. Natural language, image recognition, intelligent interaction and other technologies in AI can present the contents of intangible cultural heritage in an all-round and three-dimensional way, improve people’s visiting experience, attract more people’s attention, and thus create a new pattern of “coming alive” in the protection and inheritance of intangible cultural heritage.

## 4 Application of Artificial Intelligence in Protection and Dissemination of Intangible Cultural Heritage

### 4.1 Modeling and Simulation Technology

From the scene of history to the presence of ideas, people can be realized with the help of artificial intelligence. Artificial intelligence modeling and simulation technology has been used in many fields such as smart manufacturing, smart cities, smart agriculture, and smart medical care, and has achieved preliminary results [1]. It has also achieved initial results in facilitating the protection and dissemination of intangible cultural heritage. For example, in the process of cloisonne tire making the traditional process is optimized through digital technology. First, the traditional cloisonne model is measured and collected by laser scanning or photography to generate the three-dimensional model data of the cloisonne tire. The 3D scanning modeling is shown in the Fig. 3. The combination of artificial intelligence and three-dimensional scanning is different from ordinary scanning. Intelligent scanning uses artificial intelligence technology to realize self-learning, collection, digitization, and sorting of dynamic data about the shape, color and material of cloisonne to achieve one-to-one correspondence. Secondly, deep learning and innovation engines are used to create 3D objects. AI uses image recognition technology to achieve high-level data abstraction modeling. Deep neural networks will analyze and learn stored traditional machine-type data, and select them based on cloisonne tire specifications. 3D works that meet the requirements will be sent to the online 3D printing platform for 3D printing. AI is useful in cloisonne 3D printing's model design, material selection, and product production links, realizing the intelligence of the entire process from design to copper tire molding. The intelligent creation of the cloisonne carcass integrates AI with the "things" of the tools, enabling traditional craftsmen to be more precise, time-saving and labor-saving in the production of copper tires, and also opens up a vibrant path for the protection and inheritance of cloisonne.



Fig. 3. 3D scan modeling

## 4.2 Digital Search Technology

By introducing artificial intelligence technology into search engine technology, it not only has the traditional search and browse operation, but also can provide independent search function. Artificial intelligence intervenes in search, transforms a lot of complex and changeable information into measurable numbers and data, establishes mathematical models accordingly, and then transforms them into a series of binary codes that can be entered into the computer, which can improve the scope of search and the ability of automatic information sorting [3]. In the research of digital pattern of Nantong blue calico, it is found that the construction of a search algorithm which takes time as the parameter and blue calico recognition comparison value as the main keyword has a very significant effect on the development of blue calico pattern image data warehouse. At the same time, aiming at the characteristic that the blue calico pattern of Nantong is related to the characteristics of The Times, a binary tree structure is constructed by combining the time and the traditional binary tree. First, a binary tree structure is constructed by taking the time parameter as the main index. Then, in each time block, a linked list structure based on the blue printed cloth pattern recognition comparison value is constructed by using the blue printed cloth pattern recognition comparison value, so as to construct a spatial binary tree on the whole, which can achieve the purpose of efficient retrieval of blue printed cloth pattern in Nantong. The schematic steps are shown in Fig. 4. A large number of experiments show that using OpenCV machine vision in a Java EE environment library function after a series of standardized treatment was carried out on the blue prints images, reusing the searching space of dynamic tree implementation blue

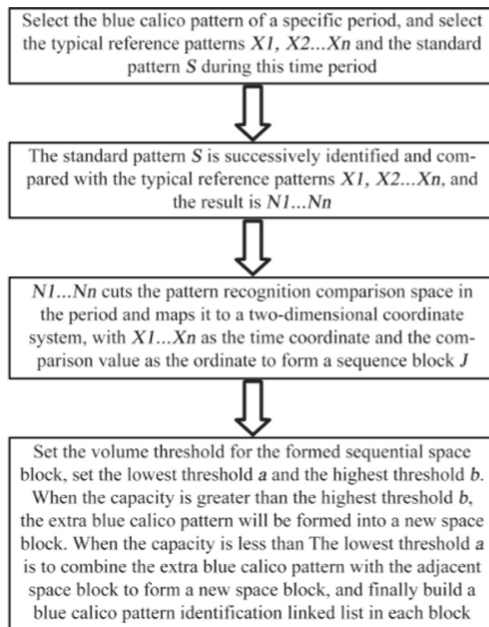


Fig. 4. Schematic diagram of the search space tree structure of the new blue calico image database

calico pattern database search function, not only on the time efficiency has increased significantly, and also made a breakthrough in terms of accuracy. The application of digital search technology for blue calico pattern also provides a very important reference direction for the protection and dissemination of other intangible cultural heritage in China.

## 5 Conclusion

In the context of the great integration of art and science, the innovative design of artificial intelligence and intangible cultural heritage continues to experience pioneering innovation. It is time to record, protect, inherit and apply the intangible cultural heritage projects that are still alive today through artificial intelligence technology, so as to preserve the precious intangible cultural memory for mankind in the future, which has immeasurable historical value and humanistic value. It is expected that artificial intelligence technology can be effectively applied to the protection and inheritance of intangible cultural heritage, give play to the creativity of artificial intelligence, promote the sharing of intangible cultural heritage resources, effectively expand the scope and speed up the transmission of intangible cultural heritage, and open up new ideas for the inheritance of intangible cultural heritage.

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