

## Digital Protection And Innovative Development Of "Big Data +" Chinese Calligraphy

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**Abstract:** Calligraphy big data is the only way for the sustainable development of traditional calligraphy in the information age in the future. With the powerful analysis and storage function of big data, calligraphy is effectively protected and deeply mined. A series of digital information systems, such as calligraphy big database, calligraphy online communication platform and calligraphy online evaluation system, are established. Through the Internet of things, cloud computing and other means to develop the cultural value, scientific value, historical value and emotional value of calligraphy.

In 1980, Alvin Toffler, a famous American futurist, futurist and social thinker, put forward the concept of "big data" for the first time in his book the third ware. However, after the concept of big data was proposed in the 1980s, it did not cause great repercussions in the society or even attracted people's attention. With the continuous development of society, human beings have entered the "information age". One of the hallmarks of the information age is the explosive growth of information with the help of the fifth media Internet technology. In 2001, Doug Laney, an analyst of meta group, proposed the "3vs" (velocity, variety and volume) model to describe the characteristics of data. Later, with the continuous growth of data, international research institutions such as Gartner, IDC and other institutions put forward the views of 4Vs, 5vs and 6VS on the basis of 3vs, that is, adding the views of variety, visualization and validity. Big data, which is different from the traditional data, combines with the Internet of things, cloud computing and other emerging technologies, has been widely used in the Internet, finance, telecommunications, government, medical care, transportation, logistics, agriculture and other industries, and has realized the efficient and reuse of data, and developed the space of human self-potential.

As a cultural treasure of our country and even the whole world, calligraphy art is an opportunity to integrate into the development of the times for the calligraphy art as a traditional culture of thousands of years under the global opportunities and challenges brought by the impact of big data. However, it is very necessary to think about how to make calligraphy art catch the fast train of big data development. On the premise of protecting traditional calligraphy art resources, it is very necessary to think about how to make calligraphy art radiate vitality in the era of big data.

### 1. Concept and composition of calligraphy big data

Big data started in the IT field, mainly refers to the data that cannot be processed by traditional data processing methods in a limited time. [1] The construction of calligraphy big data is a calligraphy big data set based on the traditional culture and art of calligraphy, which uses the characteristics of large amount, diversity and speed of big data. The big data set of calligraphy covers calligraphy image, calligraphy retrieval, calligraphy identification, calligraphy design, calligraphy history, calligraphy theory, calligraphy education, etc. In 2007, Professor Wu Jiangqin of Zhejiang University of the National Natural Science Foundation of China put the calligraphy works on the paper and silk, bamboo slips and gold and stone collected in the museum to be preserved and disseminated in a digital way in the "Research on calligraphy image index and matching algorithm". Through the key algorithm of calligraphy image matching and index, the goal of retrieving large amount of calligraphy image efficiently and quickly is achieved. The combination of big data and

calligraphy provides convenient conditions for the spread of Chinese calligraphy, so that anyone can understand, learn and appreciate Chinese calligraphy in any place, which has far-reaching significance for the forward development of Chinese traditional culture. In 2008, Professor Zhang Jie of Nanjing University, in the National Natural Science Foundation of China, took the Chinese characteristic landscape Calligraphy Landscape as the research object in his project "Case Study on the geographical differentiation and sense of place process of Chinese Calligraphy Landscape", and used the method of qualitative analysis and scientific demonstration to study the Calligraphy Landscape in different landscapes, such as ancient towns, historical and cultural blocks. This paper uses a series of technical means to explore the relationship between Calligraphy Landscape and the change of urban cultural landscape, and provides a series of guidance for the protection and construction of calligraphy, a cultural landscape with Chinese characteristics and urban cultural landscape. In 2012, in the project of "Research on calligraphy identification technology based on visual perception and transfer learning", Professor Zheng Xia of Zhejiang University carried out calligraphy identification research based on visual perception and transfer learning, taking calligraphy works in the form of digital images as the object. Calligraphy identification is a key link in the preservation and dissemination of calligraphy. With the rise of modern calligraphy industry and calligraphy market, the importance of calligraphy identification is particularly important in a large number of calligraphy works. The establishment of calligraphy personality knowledge base under big data and the automatic identification of inscriptions play an important role in calligraphy identification. The establishment of calligraphy database is conducive to the excavation, preservation, inheritance, inheritance, dissemination, development, innovation and exchange of Chinese calligraphy.

## **2. The urgency and necessity of establishing calligraphy digital protection system under big data**

The protection of calligraphy culture under big data is facing the situation of urgency and necessity, which has been paid attention to in construction, traditional Chinese medicine and other industries. In the construction industry, big data is used to establish the three-dimensional structure of buildings. Through the analysis of massive buildings, especially the analysis of ancient buildings, the influence of factors such as humidity, environment, climate and natural disasters on ancient buildings is obtained, which provides constructive suggestions for the further protection and repair of ancient buildings. Chinese calligraphy, written on oracle bones, bronze, bamboo and silk and paper, has gone through the baptism of thousands of years, and there are few outstanding calligraphy works. Because of the long-term damage of paper, the decay of bamboo slips due to the influence of climate, and the abrasion of gold and stone due to the influence of time and natural factors. In addition to the protection of these precious historical and cultural materials with modern technology, such as humidification, oxygen isolation and other means, things will inevitably have irresistible damage to varying degrees due to the objective law of development, or other unpredictable factors such as natural disasters and man-made disasters will inevitably have a devastating impact on these excellent calligraphy works. In history, due to natural factors such as earthquake, fire, flood and other natural factors, such as the burning of books by Qin Shihuang, the burial of Emperor Taizong in Lanting Xu, the military disorder of the Taiping Heavenly Kingdom, and the burning of the Yuanmingyuan by the British and French allied forces, a large number of precious cultural and artistic treasures have disappeared, which is an irreparable huge loss to the entire human civilization. Now the development of big data has become more and more mature. Through modern information technology, we can collect image information, material information, calligrapher information, ink method information, stroke information, knot information, composition information, content information and emotional information, and establish a database for protection. Using the Internet of things, cloud computing and other modern technologies to classify and summarize the massive information in the database, which makes the original single calligraphy development form present the trend of interdisciplinary development, and accelerates the cross integration of different subjects. For some precious calligraphy, such as the "snow when

it's snowing" and "nephew's manuscript" and other rare inscriptions, big data is used to analyze the safety evaluation, value prediction, performance evaluation and other aspects, and generate evaluation reports. Considering the cost performance comprehensively, the protection and development of different degrees and levels are carried out. By using the powerful and rapid analysis ability of big data, this paper analyzes the calligrapher's life course and creation period, so as to form a calligrapher's life trajectory map or calligraphy creation process chart, or even a composite diagram of the two situations. Under the guidance of the chart, it can more directly reflect the relationship between Calligraphers' life course and calligraphy creation, which is conducive to the comprehensive and three-dimensional research on calligraphy creation. Driven by big data and Internet of things technology, big data calligraphy exhibition can be carried out with the help of Internet platform. Big data calligraphy exhibition is different from the general Internet calligraphy exhibition. It can quickly analyze calligraphy works in different situations and periods through big data, and analyze the works created by the same author in different life stages and different moods, which provides a quick and convenient channel for the research of calligraphy art. With the continuous spread of Chinese culture in recent years, Chinese calligraphy as a typical representative of Chinese traditional culture, the establishment of a calligraphy database is conducive to the foreign exchange of Chinese traditional culture. Even in the weak areas of foreign calligraphy culture, using the rich resources of the big database of calligraphy can also spread and popularize the calligraphy culture. The big database of Chinese calligraphy has the characteristics of "4Vs". It has a large number of velocity, various materials, various types of calligraphy, vairety, and veracity. These features help people to find the required data timely, efficiently and accurately in the voluminous calligraphy database, which is of great significance for the in-depth mining of calligraphy culture and even Chinese traditional culture.

### **3. Innovation and development of calligraphy Digitization based on big data**

The big data of calligraphy brings new opportunities for the development of calligraphy, which is the representative of traditional culture. The establishment of a large database of calligraphy is helpful to read the excellent inscriptions of past dynasties online, saving manpower, material resources and financial resources, which is of great help for people to quickly and effectively understand the corresponding historical and cultural knowledge. The establishment of online calligraphy evaluation system can greatly reduce the impact of human factors on calligraphy evaluation, contribute to the fairness and justice of calligraphy competition, improve the evaluation efficiency and save evaluation resources. The digitization of calligraphy is helpful to improve the quality of calligraphy education, to accurately grasp the teaching staff, teaching materials and learning situation of calligraphy teaching, and to establish a set of scientific and standard system.

#### **3.1 Coordinated development of calligraphy culture**

"With the development of the Internet and the gradual maturity of big data technology, the combination of digital calligraphy technology and Internet and big data technology has become increasingly close. In order to realize the collaborative experience of traditional and modern calligraphy creation and bridge the information gap between calligraphy lovers, digital creation of calligraphy works, collaborative creation of calligraphy works collection and intelligent evaluation of calligraphy works have become the important needs of the current calligraphy industry "[2]. The collaborative development of calligraphy is to establish an online communication platform of calligraphy based on the premise of calligraphy database. Calligraphy online communication platform includes calligraphy theory exchange, calligraphy skills exchange, calligraphy resources exchange, etc.

Based on the premise of calligraphy database, users put forward their own opinions on different calligraphy work numbers on the same platform. According to the standard of general calligraphy theory in the calligraphy database, combined with the suggestions of other online users, and using the powerful analysis ability of big data, users can comment on the calligraphy of different users. Finally, the same or different opinions are input into the calligraphy database again, and different

levels of classification are given according to the level of theoretical level. In the future theoretical reference, the proportion of evaluation is divided according to the grade.

The exchange of calligraphy skills requires the establishment of big data and the establishment of intelligent calligraphy exchange platform. Users write on the intelligent touch screen in the form of traditional brush writing. The calligraphy exchange platform remembers the turning point, pause, stroke and structure in the writing process, and integrates big data to communicate comprehensively. Using the powerful analysis ability of the database, the online creation of calligraphy can effectively promote the exchange of calligraphy.

Calligraphy digitization can promote the sharing and exchange of calligraphy resources. The establishment of the calligraphy database covers most of the inscriptions. However, there are still some excellent calligraphy works left in the hands of private collectors or all over the world. The digitization of calligraphy resources can maximize the development and sharing of calligraphy resources on the premise of ensuring the ownership of the tablet owner, so as to meet the needs of other users. In addition, the calligraphy database can be continuously supplemented and improved on the premise of resource contribution.

### **3.2 Online evaluation of calligraphy works**

The establishment of online evaluation system of calligraphy works can not only meet the evaluation needs of calligraphy competition, but also meet the needs of calligraphy education, individual calligraphy enthusiasts and calligraphy market. In the calligraphy competition, we can evaluate the competitive works objectively and save the evaluation resources to the maximum extent. In the current calligraphy education, calligraphy teaching is faced with the problems of few full-time calligraphy teachers, uneven level of teachers and lack of calligraphy teaching resources. The establishment of calligraphy online evaluation system can make calligraphy learners have a scientific and fair evaluation standard, and solve the problem of limited school calligraphy teaching resources as much as possible. In the absence of professional tutors, individual calligraphy enthusiasts can meet the learning needs of self-learners with the help of calligraphy exchange platform and online evaluation system.

### **3.3 Quality improvement of Calligraphy Education**

At present, there are several modes of calligraphy education in China, such as family style master apprentice inheritance, school organization training, self-study and so on. In the process of family style master apprentice education, the quality of learners' calligraphy largely depends on the master's level. In the traditional master apprentice teaching, calligraphy learners are easily limited by objective factors and lack of communication with the outside world, which makes calligraphy unable to achieve long-term development. The introduction of modern digital technology, such as calligraphy big database, calligraphy online communication platform, can make calligraphy "from the original single dimensional data analysis to the integration of multiple data; From the original closed data to open source shared data, it releases space for the deep mining of big data, and stimulates the interdisciplinary integration "[3], which enables calligraphy learners to break through the original limitations, get rid of the old shackles, and effectively improve the calligraphy level in a certain period of time.

In addition to the traditional family master apprentice inheritance, school education is also an important way of calligraphy education. In the examination oriented education of primary and secondary schools, calligraphy education is close to zero. Some schools may have calligraphy interest classes, but they only regard it as an extracurricular interest and do not attach importance to the inheritance and practice of calligraphy. Calligraphy Education in primary and secondary schools is also faced with a problem, that is, there is no professional calligraphy classroom, lack of corresponding calligraphy teaching materials, calligraphy teaching mode, calligraphy teaching equipment, calligraphy evaluation system, etc., which leads to the stagnation of the development of calligraphy education in primary and secondary schools. Combining traditional calligraphy education with calligraphy database and other platforms and displaying teaching on mobile terminals or multimedia projectors will quickly solve the problems faced by modern calligraphy

education and teaching in primary and secondary schools under the limited conditions of teachers. In 2015, the Institute of automation of the Chinese Academy of Sciences developed an instrument for writing with a brush on the intelligent writing platform, and correspondingly put forward the concept of "intelligent calligraphy". "With the gradual maturity of calligraphy experience technology, the Automation Institute, in cooperation with" calligraphy into the classroom ", plans to develop an intelligent desk integrating calligraphy education, literature education and cultural education, so as to provide a new intelligent solution for calligraphy education, art education and humanistic education in primary and secondary schools in the new period [4], making traditional calligraphy appear a new form of" artificial intelligence + ".

## Conclusion

Calligraphy big data is the only way for the sustainable development of traditional calligraphy in the information age in the future. With the powerful analysis and storage function of big data, calligraphy is effectively protected and deeply mined. A series of digital information systems, such as calligraphy big database, calligraphy online communication platform and calligraphy online evaluation system, are established. Through Internet of things, cloud computing and other means, we will develop the cultural, scientific, historical and emotional values of calligraphy, and combine calligraphy, the common memory of Chinese people, with modern science and technology. It can not only promote the long-term development of calligraphy, but also promote the extensive exchange of calligraphy among different subjects, and widely apply calligraphy culture in various fields of society, so as to promote the sustainable development of modern calligraphy under big data.

## References

- [1] Guo Guangming. Research on user credit profiling method based on social big data [D]. Beijing: University of science and technology of China, 2017
- [2] Yang Yi, Li Guoqing, Wang Jian, Wang Haijun, Zhai Yichen, Huang Weixing. Calligraphy big data platform combined with cloud [J] Journal of Zhejiang University (SCIENCE EDITION), 2020, 47 (04): 397
- [3] Li Aiqun, Hou miaolu, Dong Youqiang, Yang Su, Li zongfei, Hu Yungang. Exploration on the construction of architectural heritage big data [J] Natural and cultural heritage research, 2020,5 (04): 31
- [4] Yan min. can artificial intelligence help Calligraphy Education [N]. China culture daily, February 11, 2018 (005)
- [5] Gang Xie,Yatong Qian,Shouyang Wang. Forecasting Chinese cruise tourism demand with big data: An optimized machine learning approach [J]. Tourism Management, 2021, 82.
- [6] Siqi Bai,Yongjie Luo,Mingjiang Yan,Qun Wan. Distance Metric Learning for Radio Fingerprinting Localization [J]. Expert Systems. With Applications, 2021, 163.
- [7] Dawei Sun,Hanyu He,Hongbin Yan,Shang Gao,Xunyun Liu,Xinqi Zheng. Lr-Stream: Using latency and resource aware scheduling to improve latency and throughput for streaming applications [J]. Future Generation Computer Systems, 2021, 114.
- [8] Tao Niu,Bo Hu,Kaigui Xie,Congcong Pan,Hongyang Jin,Chunyan Li. Spacial coordination between data centers and power system considering uncertainties of both source and load sides[J]. International Journal of Electrical Power and Energy Systems, 2021, 124.
- [9] Sepideh Kaffash,An Truong Nguyen,Joe Zhu. Big data algorithms and applications in intelligent transportation system: A review and bibliometric analysis [J]. International Journal of Production Economics, 2021, 231.