

Cite space-based research on the use of artificial intelligence in the field of literature and museums

Wei Sun

Nanjing University of Finance and Economics; Home address: 302, No.71, Vision Jiayuan, Lane 380, Xingzhi Road, Dachang Town, Baoshan District, Shanghai

1904389496@qq.com

Abstract. In recent years, with the rapid development and application of artificial intelligence technology, image technology based on artificial intelligence has gradually become a research hotspot in the field of cultural relic restoration. This article will explore the application of artificial intelligence based image technology in the field of cultural relic and museum restoration. Firstly, the importance of restoring cultural relics and artifacts was introduced, as well as the limitations and shortcomings of traditional restoration methods. Secondly, elaborate on the development and application of artificial intelligence technology, as well as its potential and advantages in the field of cultural relic restoration. Next, we will introduce the application of artificial intelligence based image technology in cultural relic restoration, including image enhancement, segmentation, recognition, and reconstruction. Finally, the application prospects and challenges of artificial intelligence based image technology in the field of cultural relic restoration were summarized, and future research directions and suggestions were proposed.

Keywords: Artificial intelligence, Image technology, Cultural Relics Restoration, citespace

1. Introduction

With the rapid development of the information age, Artificial Intelligence (AI) is penetrating into various fields at an unprecedented speed, bringing unprecedented opportunities and challenges for human beings. The field of literature and exposition is a comprehensive field integrating history, culture and art, which carries the development of human civilization and the inheritance of cultural heritage. This field involves a wide range of aspects, including the collection, protection and research of tangible cultural heritage such as historical relics and artworks, as well as the inheritance, promotion and innovation of intangible cultural heritage. Therefore, in the field of literature and exposition, the application of artificial intelligence also shows strong potential and unlimited possibilities.

With the help of literature research and visualization analysis, we focus on the current situation, hotspots and development trend of the practical application of AI in the field of literature and exposition through data reality technology, 2.5D surface structure reconstruction and other methods. The purpose of this paper is precisely to comprehensively elaborate the hotspots and development trends in the field of literature and exposition by combing a large amount of related literature, so as to better grasp the development pulse and future direction of artificial intelligence in the field of literature

and exposition. Through the research and application in the field of literature and exposition, we can better protect and inherit the cultural heritage and promote the development of cultural diversity and the progress of human civilization.

2. Research methodology

2.1. Research methods

The research methods used in this paper mainly include literature research and visualization analysis. Through the combination of these two methods, it is possible to comprehensively and deeply understand the current situation and development trend of the application of artificial intelligence in the field of literature and exposition.

First of all, through literature research to understand the current situation and development trend of the application of artificial intelligence in the field of literature and exposition. Literature research is the foundation of this paper, through literature review and synthesis, we can understand the current status and development history of the application of artificial intelligence in the field of literature and exposition. Specifically, we will collect literature on the application of AI in the field of literature and exposition through academic databases, academic websites and other channels, including academic papers, patent applications, technical reports, product introductions and so on. By classifying, summarizing and concluding these literatures, we can understand the current status of the application of AI in the field of literature and exposition, research progress and existing problems, which will provide theoretical support and experience for the subsequent visualization and analysis.

Then, the cite space tool is used to visualize and analyze the relevant literature to explore the hotspots and development trends of artificial intelligence in the field of literature and exposition. Visualization analysis is the core method of this paper's research, and through visualization tools such as cite space, we can conduct in-depth analysis and mining of the collected data to understand the hotspots and development trends of artificial intelligence in the field of literature and exposition. Specifically, we will use cite space software to generate and analyze the graphs of the processed data, and generate visualization results such as keyword graphs, institutional cooperation graphs, and so on, by setting appropriate thresholds, node types, connection types, and other parameters. By interpreting and analyzing these maps, we can discover the hotspots and trends of research, and further understand the current status and development direction of the application of artificial intelligence in the field of literature and exposition.

2.2. Statement of opinion

According to Figures 1 and 2, the keyword clustering is analyzed based on cite space. It can be found that the keywords with the highest degree of relevance are "cultural heritage" and "artificial intelligence", which indicates that in the field of literature and exposition, artificial intelligence has a close connection with the protection, inheritance and display of cultural heritage.

First of all, cultural heritage is the accumulation of history and culture of a country and nation, and it contains many cultural relics and cultural heritage with precious value. However, with the passage of time, many cultural heritages face problems such as protection difficulties and interruption of inheritance. And the development of artificial intelligence technology provides new possibilities and means for the protection and inheritance of cultural heritage. For example, through AI technology, cultural relics can be digitally modeled and virtually restored to achieve accurate protection of cultural relics; at the same time, cultural heritage can also be intelligently identified, classified, and retrieved using AI technology to improve the efficiency of management and utilization of cultural heritage.

Secondly, AI technology can also provide a richer and more three-dimensional way for the display of cultural heritage. The traditional way of displaying cultural heritage is often relatively single, and it is difficult to comprehensively display the value and connotation of cultural heritage. Artificial intelligence technology can present a more realistic and vivid cultural heritage display effect for the

audience through virtual reality, augmented reality and other technical means, enhancing the audience's sense of immersion and experience.

In general, the application of artificial intelligence technology in the field of literature and exposition is a topic worthy of attention and exploration. Through keyword clustering analysis, we can find the close connection between artificial intelligence and cultural heritage, which provides new ideas and directions for future research and application. It is believed that with the continuous progress of technology and the expansion of application scenarios, AI will play an increasingly important role in the field of literature and exposition, and contribute more power to the protection and inheritance of cultural heritage.



Figure 1. Keyword analysis based on cite space



Figure 2. Keyword clustering based on cite space

3. Current status of applications

With the continuous development of science and technology, artificial intelligence has gradually penetrated into various industrial fields. In the field of literature and exposition, artificial intelligence technology has also shown strong application potential and value.

Through the analysis of related literature, it can be handed over to the fact that the current application of artificial intelligence in the field of literature and exposition is mainly focused on the following aspects:

3.1. Virtual museum

By utilizing technologies such as Virtual Reality (VR), Augmented Reality (AR) in the physical world and Mixed Reality (MR) allows it to interact virtually in the physical world. Artificial Intelligence allows for a comprehensive and detailed recreation of cultural heritage, providing an interactive visitor experience. Audiences can tour museums through virtual reality devices to gain an immersive experience and gain a deeper understanding of the connotations and values of cultural heritage. For example, as shown in figure 3, Ko et al. created an image display system to communicate and interact with visitors in the characterization of a Korean admiral at sea, and have an interactive navigation for them by interacting with them in a game about understanding historical information.

3.2. Identification and restoration of cultural artifacts

The identification and restoration of cultural relics is a crucial part of cultural relics protection work, and with the continuous development of artificial intelligence technology, more and more experts have begun to try to utilize this technology to assist the identification and restoration work. In this article, we will combine a 2.5D surface structure reconstruction method based on linear sensor imaging system, in which the local method and global method are two main methods for reconstructing the depth map, so as to discuss the application of artificial intelligence technology in the field of cultural relics identification and restoration in depth.

According to the Lambert reflectance model, a model describing the reflective properties of an object's surface, to represent the isotropic reflective properties of an object to light.

When the i th light source illuminates a Lambert reflector, the intensity of the diffusely reflected light is proportional to the direction of the incident light and the cosine of the angle normal to the surface at the point of incidence, satisfying the following equation. Where E incident denotes the angle between the direction of light and the normal direction, L_i denotes the known matrix of the direction of light, and K diffuse denotes the diffuse reflection coefficient. For example, the surface color and gloss of artifacts may change over time. By analyzing the reflective properties of the surface of cultural relics, the age and preservation can be inferred, providing a useful reference for the identification of cultural relics.

In cultural relics restoration, global methods can be used to construct an overall three-dimensional model of cultural relics, providing a comprehensive reference for restoration work. Deep learning technology, through the learning comparison and analysis of a large number of historical artifact images and original models, global methods can help restorers better grasp the characteristics and laws of the original appearance of cultural relics. Then, these features and laws are used to repair the damaged cultural relics so that they can be restored to their original appearance as much as possible.

At the same time, deep learning technology, using least squares approximation, SOR, iteration and other methods can also be used to carry out intelligent optimization and control

of the restoration process to improve the accuracy and efficiency of the restoration work. The Poisson equation is replaced by discretizing it into a difference equation, and then $Z(x, y)$ is obtained by iterative calculation to reconstruct the height information until the SOR equation converges.

Through the application of 2.5D surface structure reconstruction method based on linear sensor imaging system, we can realize intelligent identification and restoration of cultural relics. This can not only improve the efficiency and accuracy of cultural relics identification and restoration, but also provide more scientific and reliable support for cultural relics protection. In the future, with the continuous development and improvement of artificial intelligence technology, I believe that its application in the field of cultural relics protection will be more and more extensive and in-depth. At the same time, we also need to pay attention to the social problems that may arise in the actual application of artificial intelligence technology, in order to ensure the reasonable application and development of artificial intelligence technology.

In summary, the application of artificial intelligence technology in the field of culture and exposition is a field full of opportunities and challenges. Through continuous exploration and practice, we believe that we can better utilize this technology to provide more comprehensive support and services for the development of cultural and museum career. At the same time, we also need to pay attention to the problems and challenges that may exist in the application process of artificial intelligence technology, and continue to strengthen the exploration and research of artificial intelligence technology.

3.3. Exhibition Planning

Exhibition planning also plays an indispensable role in the field of culture and exposition, which is not only an important means to show the scientific and cultural heritage, but also an important way to promote communication and interaction.

First of all, exhibition planning provides the audience with the opportunity to deeply understand the scientific and cultural heritage. Through targeted planning, all kinds of scientific and cultural heritage products are displayed in an organized and characteristic way, which enables the audience to comprehensively understand the history, current situation and future development trend of scientific and cultural heritage. This not only enhances the audience's scientific and cultural literacy, but also stimulates their interest and enthusiasm in scientific and cultural heritage.

Secondly, exhibition planning is also an important bridge to promote cross-region and cross-discipline exchanges and cooperation, and Y. Jo et al. have written an article mentioning that exhibition planning needs to take into account the needs of audiences in different regions, the

characteristics of the exhibits, the theme of the exhibition and other factors. Therefore, through exhibition planning, the scientific and cultural heritage products of different regions can be centrally displayed, which strengthens inter-regional communication and cooperation. At the same time, it also promotes the communication and cooperation between different fields and promotes the innovation and development of scientific and cultural heritage.

Finally, the use of modern technological means also provides more possibilities for exhibition planning. For example, Y. Jo et al. have utilized advanced technologies such as virtual reality and augmented reality to bring audiences richer, more vivid and three-dimensional display effects and enhance their visual and auditory experiences.

To summarize, the application of exhibition planning in the field of literature and exposition has a wide range of prospects and far-reaching significance. Through in-depth discussion of the specific applications and considerations of exhibition planning, it can provide more ideas and inspirations for the innovation and development of scientific and cultural heritage. At the same time, with the continuous progress of science and technology and the continuous improvement of innovation consciousness, it is believed that the application of exhibition planning in the field of culture and exposition will achieve more excellent results and make greater contribution to the development of human civilization.

4. Hot spots and development trends of artificial intelligence in the field of literature and museums

4.1. Hot spots

4.1.1. Quality of data. The application of Artificial Intelligence (AI) in the field of literature and exposition has gradually become a hot issue that cannot be ignored. Among them, data quality is a major challenge in the application of AI in the field of literature and exposition.

First of all, the amount of data in the field of literature and exposition is extremely large. From ancient times to the present, human beings have created a huge amount of cultural heritage, and each piece has rich background information and historical stories. In order to better study and utilize cultural heritage, it is necessary to collect a large amount of data in various forms, including text, images, and videos. However, the sources of these data are complex and in various formats, which brings great difficulties in organizing and classifying the data.

Secondly, the quality of data is also a major problem. In the field of literature and exposition, many data are unstructured, such as images and videos, and the quality of these data is often affected by a variety of factors such as shooting equipment, light, angle, and so on. At the same time, there may be errors in the process of data acquisition, such as unclear captured images and inaccurate labeled information. These will affect the training effect and application accuracy of the AI algorithm.

Taking art appraisal as an example, Figure 4 shows that the carrier of digital art has various forms such as data, images, etc., and the AI algorithm needs a large amount of high-quality image data for training in order to improve the accuracy of appraisal. However, these data are often difficult to obtain, and the identification of artwork is itself a highly subjective work, and different people may have different identification results. Therefore, how to ensure the quality and accuracy of the data is an important issue facing AI in artwork identification.

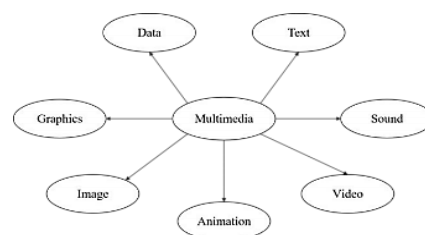


Figure 4. Carriers of digital art

Overall, data quality is a major challenge in the application of AI in the field of arts and culture. To overcome this challenge, a series of measures are needed to improve the quality and accuracy of data. For example, establishing unified data standards and management mechanisms, adopting advanced data cleaning and labeling technologies, and strengthening data security and privacy protection. Only in this way can we better promote the development and application of AI in the field of arts and culture.

4.1.2. Privacy protection. Privacy protection is an important issue that cannot be ignored in AI applications. Nowadays, digital reality technology is increasingly used in the global innovation and cultural industry (CCI) with the aim of transforming static cultural heritage into more attractive and vivid dynamic images. However, in the field of culture and museums, which involves a large amount of personal data and sensitive information, privacy protection, and privacy risk issues will become increasingly prominent. Taking museum guide services as an example, many museums use smart devices to provide personalized recommendations for visitors in order to provide a better visiting experience. However, these devices can easily trigger the problem of privacy leakage when collecting visitors' behavioral data, preferences and other information.

In short, privacy protection is a problem that must be emphasized in the application of artificial intelligence in the field of culture and museums. In order to ensure that the privacy rights of tourists are effectively safeguarded, museums need to establish a perfect data protection mechanism and take a variety of measures to strengthen data security and privacy protection. Only in this way can tourists enjoy the quality services brought by AI technology with confidence.

In conclusion, interdisciplinary collaboration is an important trend in the application of AI in the field of arts and culture. By combining knowledge from multiple disciplinary fields with AI technology, it can promote the protection and inheritance of cultural heritage, and at the same time provide a richer and more interesting cultural and museum experience for modern people.

4.2. Development trends

4.2.1. Intelligent monitoring and protection. With the development of Internet of Things, sensors and other technologies, artificial intelligence has gradually become the core driving force of various industries, and more intelligent monitoring equipment will be applied to the protection of cultural heritage in the future. The core of intelligent monitoring is data acquisition, processing and analysis.

Through high-precision image acquisition and sensor technology, AI can monitor the data of cultural relics collections in real time, discover and deal with potential threats in a timely manner, so as to improve the decision-making support for preventive protection, and gradually improve the efficiency and accuracy of protection work. At the same time, based on big data analysis and machine learning and other technologies to process and analyze the monitoring data, according to the AI algorithm to predict the degree of aging of cultural heritage, collections, to develop a more effective restoration program, so that you can more accurately understand the status of cultural relics and trends, to provide a more scientific and reliable basis for its protection work, so as to jointly promote the protection and inheritance of cultural heritage.

4.2.2. Intelligent Resource Building and Utilization. With the continuous development of digital technology, more intelligent ways of resource construction and utilization will emerge in the future. For example, converting paper books into digital format through OCR and other technologies is not only conducive to long-term preservation, but also makes it more convenient for readers to read and download online; recommending relevant book resources and subject knowledge for readers through intelligent recommendation and other technologies; and organizing and displaying cultural heritage resources through knowledge mapping and other technologies. These intelligent resource construction and utilization methods will further improve the dissemination effect and social influence of cultural heritage.

4.2.3. *Intelligent cross-border integration and innovation.* With the deepening of cross-border integration and the increasing awareness of innovation, more intelligent cross-border integration and innovation methods will emerge in the future. For example, the fusion and innovation of artificial intelligence technology with technology in other fields, such as robotics, biotechnology, etc., will bring more possibilities for the protection and inheritance of cultural heritage; at the same time, cooperation and exchange with other industries will also bring more cross-boundary resources and creative inspirations to the field of culture and exposition, thus promoting its continuous innovation and development.

5. Conclusion

Through the visualization and analysis of the application of artificial intelligence in the field of literature and exposition, it can be found that the research in this field has achieved certain results, but there are still some problems and challenges that need to be solved, such as the difficulty of data acquisition and processing, and the high cost of technology application. In the future, with the continuous progress of technology and the continuous expansion of application scenarios, the application of artificial intelligence in the field of literature and culture will be more in-depth and extensive.

In conclusion, the application of artificial intelligence in the field of culture and exposition is a field full of opportunities and challenges, and in the future, we need to work together to strengthen cooperation and communication to promote the sustainable development of this field to provide more intelligent and efficient solutions and services for the protection and inheritance of cultural heritage.

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