Ancient Forms, Modern Minds: Artificial Intelligence in the Revival of Chinese Sculpture

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Abstract: It is within this context of continuous recontextualization of traditional sculpture that this review paper unfolds by examining the interaction of Chinese ancient sculpture with present-day AI technologies. The art of sculpture in China has changed and has been rooted in a long history of producing sculpture recreations for over thousands of years, with the Tang dynasty tending toward naturalism and the spiritual element in the piece, especially in Buddhist influence. Although old forms nowadays can be considered innovative in terms of contemporary art, AI appeared to be the enabling means in recent years. In the given paper, the author analyzes case examples of the performance of AI algorithms in making AI digital reproductions of iconic artworks, interpreting new representations of the classical Buddhist figures, and developing new means for audience engagement through IoT technology. Examining such connections, the paper responds to essential concerns regarding authorship, creativity, and the position of the artist in the modern world. At last, this study discovers that this extension of Chinese sculpture through AI is an homage to its past while at the same time transforming it into present and future discourse, creating a subversion of the uncanny. Self-Planning As artists progress in using AI, the blend of traditional and conventional art with new technology revives and changes the perspective of Chinese sculpture's future, more connected to their roots.
Keywords: Chinese Sculpture, Artificial Intelligence, Cultural Revival, Digital Art, Traditional Techniques, Interactive Art.

1. INTRODUCTION

One of the most important trends in contemporary culture is the integration of classic art and high-tech means, with considerable emphasis on culture as the means of art preservation and restoration. The revival of the art forms in light of unique technological development is an important subject, and Chinese sculpture has a rather liberal and extended background that has been developed from thousands of years ago. Chinese sculpture of the premodern period has offered scholars a way to view the evolution of Chinese society, politics, culture, religion, and aesthetics. However, due to the passage of time, many of these ancient masterpieces have been left in very poor condition, and in fact, a number have been almost destroyed because of environmental factors, lack of concern, and

political unrest. This is where modern innovation is most important of all, the innovation of the current century, Artificial Intelligence (AI), which takes the roles of redefining, rediscovering, and even recreating these ancient forms (Peng et al., 2023). Until recently, it appeared that artificial intelligence had little to do with art, yet today it is considered to be one of the prospects for reviving Chinese sculptures. Recent innovative AI solutions such as machine learning, computer vision, 3D modeling, and generative design make it possible to create better ways of preserving and reconstructing the sculptures that are broken or have been lost. Thanks to these technologies, it is now possible to simply capture an image, create a 3D model, and reconstruct and attempt to visualize what these sculptures would have looked like at the time these pieces were created. In many ways AI has turned into a helper to art historians, archaeologists, and conservators who aim to keep such pieces alive for future generations to see and better understand Chinese art and history (Nolan, 2022). In addition to preservation, AI is also changing how and what we interact with—the actual functionality of ancient art. Using VR technology, AI opens the world of augmented reality (AR) and 3D printing, which can provide an active possibility of viewing sculptures and bring them to life again in an exciting manner that may be appealing to the general public. Moreover, the idea of using the historical styles as a basis for developing new types of sculptures applies AI in an interesting manner, which is the possibility to transform the Chinese sculpture to (Naveenkumar et al., 2022). The connection between archaic structures and contemporary brain functions has rarely been so lively. AI, in the context of the Chinese sculpture revival, comingles tradition and progression, or the Old World with a New World in a single benchmark. However, a detailed analysis of this intersection lies beyond the scope of this paper; instead, in the following section, the various applications of AI technologies to Chinese sculpture will be discovered together with the opportunities and risks associated with this progressive method of cultural conservation and art production. In the revival of Chinese sculptures through AI, new ways for interacting with one of the world's oldest art forms are made possible by infusing the discipline with modern technologies (Montgomery & Keane, 2004). In this paper, several functions of AI as a tool to restore and re-interpret the Chinese sculpture will be disclosed. In the present work, we shall discuss in detail the technologies and methodologies used, the limitations encountered, and, of course, the impact of this twenty-first-century infusion on a tradition as old as civilization. In this case, it is seen how, through the lens of AI, both technical and artistic, it is possible to

answer the question of how, within the framework of art conservation and creativity as well as cultural heritage, AI operates effectively in such a highly specialized area as Chinese sculpture.

2. HISTORICAL CONTEXT OF CHINESE SCULPTURE

Chinese sculpture is a stylistically complex art form shaped by rich cultural, religious, and philosophical backgrounds and extending over millennia. Beginning from the Neolithic period and possibly earlier until the large-scale religious and political sculptures that characterized the imperial periods, Chinese sculpture, which is the main focus of this paper, has grown with the country. It is therefore necessary to acquaint ourselves with the history of Chinese sculpture so that we may be able to explain why Chinese sculpture took the particular form that it did. It also offers the prerequisite for understanding how the application of Artificial Intelligence (AI) to preserve and reinstate these sculptures in the contemporary context (Blumenthal et al., 2003).

2.1 Early Chinese Sculpture: Beginnings and Ritualistic Forms

The roots of Chinese sculpture were as distant as the age of the Neolithic period, which was approximately 5 thousand years back in time. During these early periods, sculpture was almost wholly connected with Buddhism and the uses that this demanded, as well as the considerable use made of it in ceremonies and religious uses and rites reflecting this. In these early periods, the most commonly used materials included clay, stone, and bronze. Figurines, however, were made more for emblematic uses as proxies for fertility, ancestors, or as a means for offerings to spirits. These were largely executed for burial use, and so tiny, but often roughly, carved figures are testified by many burials. All these representations are dictated by well-rooted animistic and ancestor worship that were characteristic of early Chinese religion, the need to make contact with the spiritual world, and the presence of objects that will facilitate this need (Miller, 2019). The use of bronze material during the Shang Dynasty of China, estimated between 1600 and 1046, began a new process of sculpture. Ceramic utensils and tripods, bells, and other ritual paraphernalia of the period are equally remarkable for the finesse with which they were created. These were objects that were employed in religious events or to honor various events in history, and the details involved with their aesthetics were the result of the religious function of these pieces. It is thus clear that early Chinese

sculpture was overwhelmingly functional, incorporated into spiritual contexts, and intended to perform designated functions or bear particular meanings (McHugh, 2014).

2.2 The Development of Religious Sculpture: Buddhism and Daoism

A very significant revolution in Chinese sculpture is that during the Han dynasty (206 BCE–220 CE), Buddhism entered China. Buddhism undergoing its transformational process in Chinese society initiated a new style of artistic sculpture that was unique in its way. It is important to understand that the evolution of the Buddhist sculpture in China takes place together with the striving development of monastic Buddhism and the enhancement of Buddhist impact in Chinese society (Manovich, 2018). One of the most significant contributions to Chinese sculpture during this period was the creation of monumental Buddha statues. The arrival of Buddhism from India brought a new focus on human figures, particularly the Buddha, depicted in various poses, gestures, and with specific iconography meant to convey particular aspects of Buddhist teachings. Over time, as Chinese artisans mastered the techniques of Buddhist sculpture, they began to adapt these forms to reflect Chinese aesthetics and spiritual concepts. Early Buddhist sculptures from the Northern and Southern Dynasties (420–589 CE) marked the beginning of a fusion between indigenous Chinese styles and Indian Buddhist traditions (Liang, 2022).

Figure 1: Tang Dynasty

The Tang Dynasty (618–907 CE) is often regarded as the golden age of Chinese Buddhist sculpture. During this period, both the size and number of Buddhist statues increased dramatically, with vast cave complexes such as the Longmen Grottoes and the Yungang Grottoes housing thousands of Buddhist sculptures. The iconic Buddhist sculptures of the Tang period, often characterized by their grace, flowing robes, and serene expressions,

stand as some of the most exquisite examples of Chinese sculpture (Li et al., 2022). At the same time, Daoism—an indigenous Chinese religious and philosophical tradition—also contributed to the development of sculpture in China. Daoist religious art was often focused on representations of gods, immortals, and legendary figures. While Daoist sculpture was less monumental than Buddhist works, it was no less significant in its portrayal of Chinese cosmology and its emphasis on spiritual harmony between humanity and nature. Daoist sculpture typically portrayed divine figures in more naturalistic forms, reflecting Daoism's emphasis on the natural world, the balance of opposites, and the flow of cosmic energy (qi) (Oguche, 2023).

2.3 Imperial and Secular Sculpture: The Ming and Qing Dynasties

While religious sculpture was dominant throughout much of Chinese history, secular sculpture also flourished, particularly during the Ming (1368–1644) and Qing (1644–1912) Dynasties. These periods saw a proliferation of sculptures made for imperial courts, scholars, and wealthy patrons. Sculpture during the Ming and Qing eras was often characterized by a focus on refinement and decoration, with artists working in a variety of materials including wood, ivory, jade, and porcelain (Kittler, 1999). In the Ming Dynasty, there was a resurgence of interest in classical Chinese artistic traditions, and sculpture became closely tied to the era's revival of Confucian ideals. Sculptors during this period worked with great attention to detail, creating statues of historical figures, religious deities, and mythological creatures that were celebrated for their lifelike expressions and elaborate decoration. Some of the most famous Ming-era sculptures were made of wood and lacquer, often for use in temples and ancestral halls (Kholeif, 2018).

Figure 2: Ming Dynasty

The Qing Dynasty, which began in the mid-17th century, continued

many of the artistic traditions established during the Ming era but also introduced new influences from the imperial court and from interactions with the West During this time the Chinese sculpture had the European style in the decorative arts and made courtly statues. The Qing period, meanwhile, witnessed the emergence of room sculpture, like ivory carving, jade carving, and small sculptures of precious metals. These tiles were usually meant to be artworks that were displayed in homes or palaces—they were markers of class and refinement (Li et al., 2020).

2.4 Cultural Revolution and Modern Challenges to Chinese Sculpture

The new century put a new set of issues before Chinese sculpture that it had not faced before in the twentieth century. Therefore, after the emergence of the Republic of China and the founding of the People's Republic of China in 1949, great shifts in politics and culture occurred, which had an impact on all forms of art, including sculpture. During the period of the cultural revolution, purging those artists who failed to meet the standards of the revolution was commonplace, and many sculptures were damaged or destroyed because they were thought to be counter-revolutionary or bourgeois. During this period there was a destroying of Chinese sculptures and Buddhist art, and came the banning of traditional history and arts, which was against the ruling party (Janiesch et al., 2021). After the Cultural Revolution, renewed artistic encounters emerged during the last decades after Chinese economic and social liberation. New ideas appeared in sculpture, especially in the sphere of contemporary art. Chinese sculptors tried to work with different materials, forms, and techniques, appearing in now more traditional works, now exploring the traditions of modernism. When discussing contemporary art examples, Zhang Huan and Ai Weiwei both depict and experiment with traditional Chinese symbols and markers of culture and interweave these with messages of the new China's growing sculpture (Xue et al., 2020).

Figure 3: Qing Dynasty

Modern Chinese sculpture production is somewhere in between—on

one hand, it continues many of the traditions and sculptural styles of the past; on the other hand, it is very much influenced by present needs and creative input. Such a duality is especially apparent while looking at the current intersection of Chinese sculpture art and new technologies such as AI, which open the door to the preservation, restoration, and recreation of such a form of art as it has never been possible before (Gupta et al., 2021).

2.5 The Role of AI in the Revival of Chinese Sculpture

The Significance of AI in the New Development of Chinese Sculpture. The problem of restoration of the ancient Chinese sculptures, of which many have been worn, damaged, or even destroyed for centuries, is a task that modern technology, where artificial intelligence is playing an increasingly significant role, has not been able to solve till recently. Various enhanced technologies like 3D scanning, machine learning, and computer vision have been established as critical pillars in the digital restoration of the sculptures to avoid the aging out of these creations (Griffin et al., 2023). Moreover, the creation of new sculptures based on the historical styles in the light of the AI is the area that might be developed in the future. Specifically, the classification and comparison of the forms, techniques, and motifs of Chinese sculptures mean that the AI can help contemporary artists define how the methods ancient ones used can be reinvented and adapted in contemporary society so as to preserve the cultural heritage of China and develop it further (Ganesh & Moss, 2022). With the use of AI in the modernization of Chinese sculpture, therefore the old and new are merged without compromising the creativity. From here, AI capability to enhance and expand the future of Chinese sculpture will not only remain significant but also drive future possibilities of this art form while at the same time capturing its past in its entirety (Francastel & Cherry, 2000). The expert analysis of Chinese sculpture showcased that the art has always evolved within the influence of the religious and philosophical ideas as well as political events of the given period. Chinese sculpture represents diverse aspects of the Chinese civilization process, from rites and mystic belief to the imperial and secular epochs. While the technology expands, AI is becoming an effective means to maintain and prevent the losses of these forms, as well as recreate them and propose the ideas to the next artistic generations. Thus AI is making it possible to close the gap between BUDDHIST ART from thousands of years ago and today's TECHNOLOGY HOLLYWOOD and make the creative passion coming from history come alive to continue to inspire future generations.

3. CASE STUDIES: AI AND THE REVIVAL OF CHINESE SCULPTURE

The rebirth of Chinese sculpture by artificial intelligence (AI) has progressively become more popular as new techniques were discovered for conserving, reconstructing, and creating reinventions of antique sculptures. Talking about Chinese sculptures, one has names such as the Terracotta Army or Buddhist art of the Tang dynasty—the potential for AI in the restoration or reinterpretation of Chinese sculptures seems almost limitless. In this section, several major representative cases of how AI applies to Chinese sculpture in its process of revival illustrate the prospect of contemporary technology in not only preserving but also continuing artistic heritages (Edmonds et al., 2005).

3.1 The Longmen Grottoes Digital Reconstruction Project

The huge complex of caves placed in Luoyang, China, is known as the Longmen Grottoes, which are the area of the greatest number of exceptional ancient sculptures in China and has been listed as a World Heritage Site. Located in Yuchuan Gully, the Zixian mountain range beside the Yi River has thousands of Buddhist statues extant, and most of them were made during the Northern Wei dynasty (386–534) and Tang dynasty (618–907). Among the outstanding sculptures are the monumental Buddhas, bodhisattvas, and other figures that depict the essence of Buddhism; the train of thought, invention, and workmanship of Longmen have reached the peak of the Buddhist art of China (Duester, 2024). But today, owing to natural erosion, havoc from man, and vandalism, most of the Longmen Grottoes and their statues have been badly damaged. This is due to the fact that over the years, and especially with exposure to harsh weather, many sculptures lack limbs, faces, or basically any artistic part. It would then be monumental to restore them manually, especially considering the fact that the site is large and the sculptures are very fragile (Douglas, 2015). The Longmen Grottoes Digital Reconstruction Project, which started from a group of Chinese scholars and AI engineers who encountered this problem and tried to solve it with the help of 3D scanning and machine learning digital reconstruction. The project consisted of capturing all the details of the existing statues by using high-resolution 3D images. AI algorithms were then used to determine how the!!! damaged parts of the statues might have looked in form and with respect to the stimuli and patterns uncovered from other statues at the site, historical

data, and similar sculptures from the same period (Contreras-Koterbay, 2019). The outcomes of this project are relevant for art conservation and digital archives study. Through the process of producing digital replicas of lost parts, scientists were able to depict how the statues looked before and from there, develop a much more viable proposal where the statues are more easily comprehensible from their cultural perspective. They are also employed in virtual reality (VR) tours so that researchers and members of society alike can view the statues similar to how they appeared centuries ago (Bridle, 2013). Moreover, the idea of reconstruction through the help of technology declared as digital reconstruction seems to be more efficient in terms of preservation. Again, physical restoration requires you to make some invasive interventions; sometimes they cause additional harm to the sculptures. Meanwhile, digital models depict the sculptures as they are, and people of the future generations will be able to investigate this site without any negative impact on the statues.

3.2 The Terracotta Warriors and AI-Assisted Restoration

The Terracotta Army is an exceptional discovery made in 1974 near the capital of China, Xi'an. Built during the Qin dynasty, in 221–206 BCE, by order of Emperor Qin Shi Huang, this vast and unique formation is made up of thousands of life-sized terracotta soldiers, horses, and chariots, created with the purpose to protect the emperor in the afterlife. The terracotta warriors are unique, as are their individual features, such as faces, styles of dressing, and even positions of limbs (Bisoyi, 2022).

Figure 4: AI in Sculpture Restoration

The individual statues and reliefs have been damaged over centuries such that most of them have their limbs broken, heads missing, or facial features eroded due to burial conditions. Despite evolving as a protected cultural asset and attracting numerous scholars, it is still quite challenging to

reconstruct the dismantled sculptures because the material used is terracotta that had been damaged irreparably, and the artwork offers a piece of valuable historical background. AI has been used to help restore the Terracotta Warriors and Horses for display in the China museum. In the recent past, the scholars relied on AI applications, including machine learning and computer vision, to analyze the numerous small fragmented pieces and estimate the sculptural forms of the statues. These tools are intended to make patterns of fragments, determine what parts should be connected, and estimate how the constant statues may be when total (Zhou et al., 2017). An important aspect of the proposed AI-driven restoration is in the prediction of the lost facial features. Modern computer vision methods can identify the faces of the warriors on the preserved panels and estimate the looks of the destroyed faces, taking into account the hairstyle, face shape, and other features similar to the armor members reflected on the surfaced armor plates. Further, it is also possible to use the AI models to recreate the lost part of the figures in three dimensions, which must then be printed analogous to the lost parts to restore the figures to their original looks (Astle & Muir, 2002). These efforts have greatly helped to shorten the restoration process, as AI has the capacity to analyze larger amounts of data than previously was possible. In addition, due to the integration of an AI system, there is a decrease in human interaction with the pieces, which would otherwise result in mishandling of fragile artifacts. The usage of artificial intelligence for the terracotta warriors is a perfect example of how innovative technology supports the traditional physical technique of conservation in order to preserve these marks of antiquity for further generations but without distorting their historical authenticity (Appel et al., 2023).

3.3. 3D-Printed Reproductions of Ancient Chinese Sculptures

Due to interest in fostering appreciation and the utilization of Chinese cultural relics, several projects have utilized the AI technology to 3D print the required Chinese sculptures. This technique enables the recreation of sculptures of artifacts that might not be safe for handling or observation at their actual site, allowing the general public and scholars to have a feel of the sculptures without exposing the original sculptures to further damage (Anantrasirichai & Bull, 2022). Such an approach can be distinguished in the cooperation between Chinese museums, art institutions, and technological companies that created 3D replicas of Chinese sculptures of the early period. In each case, whether the production is in resin or bronze, AI comes into play when the high-definition, real-life scans are taken of

the original sculptures with the help of 3D scanning techniques. This process also assists in digitizing the sculptures as well as making physical reproductions that may be useful for exposition in museums or as other learning materials . For instance, to enable the visitors to see its collection more clearly, the Shanghai museum has used the 3D scanning and printing technique to create bronze and porcelain sculptures of prehistoric China, which can easily get broken when placed on public display. In the same manner, the Palace Museum in Beijing has adopted such technologies to make copies of the jade and porcelain sculptures that are in the museum to forward their works so that people can view them without physical contact with the originals. Unlike just replicating certain sculptures, AI-based 3D modeling also presents an opportunity to recreate extinct ones. Given the available fragments of sculptures and historical descriptions, AI technology is able to create new, realistic replicas of sculptures that have not survived intact. This enables one to reconstruct works of the past in and out or perhaps prepare speculative reconstructions, which would have otherwise been inconceivable. These concrete copies are also rather useful to art historians and restorers as they make copies that can be studied, photographed, and analyzed without impact on the original art piece. Also, they provide an opportunity for bringing Chinese cultural assets to a global level and making works that can be seen, for instance, only in a local museum in China, publicly accessible to the world.

3.4 The Digital Restoration of Buddhist Sculptures

AI has also been applied in another area of conserving the art heritage, especially when restoring statues and frescoes of ancient Buddhism in China. Specifically, application has been seen in the Yungang Grottoes and the Mogao Caves within Dunhuang. These sites are also some of the major locations of early Chinese Buddhist art, which include sophisticated carvings and paintings in the structures of Buddhist gods/deities, representations of the life of Buddha, and other themes that are religious in nature. The art from these cave complexes is seriously eroded, the effects of exposure to air and water, fluctuating humidity and temperature, and human interference, including vandalism. Conventional conservation techniques have been restricted in the manner in which they can address such work, especially the delicate details of the sculptures. Computer vision and machine learning are among the adopted AI technologies used to apply digital image processing to these sculptures where physical restoration is impossible. The photographs and 3D scans are fed into AI algorithms together with the photographs of the existing pieces, which then produce

digital models of what fills the gaps in the sculptures. The learning in the structure of the AI system occurs by using the image from the intact part of the sculptures as well as historical records as a way of training it to predict the missing parts shapes, proportions, and artistry. The outcome is a detailed, non-invasive, fully virtual model that documents the condition of the sculptures and additionally presents a full representation of the original shape. Such digital models can be employed in virtual real exhibitions, and therefore people can be taken through the caves in a way that they saw all the sculpture and paintings as they were. These case studies indicate how AI has offered a new pathway to the rebirth of sculpture in China.

Numerous examples of new, improved copies with the help of AI technologies are now being used alongside digital restorations of the ancient Buddha statues or replicas of the Terracotta warriors that not only help in the preservation of the actual works of art but also offer endless possibilities to recreate new visions of the actual sculptures of works of art that are either lost or damaged. With the AI advancing along the years, the application for China sculpture preservation and interpretation will inevitably develop, enabling further appreciation of Chinese art history and ensuring that these pieces remain preserved for centuries .

4. CHALLENGES AND ETHICAL CONSIDERATIONS IN THE REVIVAL OF CHINESE SCULPTURE THROUGH AI

The application of artificial intelligence in the restoration of Chinese sculptures has huge opportunities in terms of restoration and re-interpretation of the works of art. New technologies like 3D scanning facilities, machine learning specialists, and artificial intelligence-based modeling are now helping to reconstruct disappointing sculptures, create virtual images of lost and erasing masterpieces, and create exact copies of unlimited and educational works to be shown in museums. Nevertheless, this technology is involved in the field of cultural heritage with some crucial issues and questions of ethical concerns. These questions relate to questions of originality, heritage, and ownership of arts and cultures, besides addressing concerns of proper use of artificial intelligence in interpreting the past and culture. It discusses main issues and ethical considerations arising from the use of AI in the process of reviving the lost art of Chinese sculptures (14).

4.1 Authenticity and the Role of AI in Reconstructing Lost or Damaged Works

Controversies about authenticity and morality form the core of the use of AI to bring Chinese sculptures back to life. For the Chinese sculptures—in particular, for historical and religiously valued sculptures—the physical whole is highly connected. Conservation projects, especially those that involve reconstruction through the use of artificial intelligence, entail the construction of new molds or 3D-printed replicas that seek to depict what sculptures looked like initially. However, the process of reconstructing or reproducing these pieces in digital form raises the question of originality—particularly when one employs CGI technologies to recreate sections of sculptural pieces that no longer exist. For instance, for the Terracotta Warriors, people can use AI instruments to determine how facial features or body parts may have appeared if the warriors were looked at as per normal. These reconstructions only use the learned algorithms, which try to guess how the missing parts of this picture look, but they cannot create the actual, material presence of an artwork. Thus these sorts of AI-produced models, albeit useful for study and demonstration, beg the question of whether they are a form of mimetic reproduction or a kind of speculation. In this connection, the authors emphasize that the digital reproduction can be considered an approximation of the restored object, rather than the restoration itself. More challenging to address the issue of authenticity is when it comes to the use of AI to replicate pieces that were destroyed or simply disappeared. For instance, in currently lost Chinese Buddhist sculptures or religious figures, as it obtained with prehistoric monuments that were never made at all, AI restorations make use of references or portion extrapolations from existing images and historical references. In each of these instances, just how much do we rely on this AI, and at what point does interpretation enter the picture? The risk is that, owing to the algorithms and machine learning, AI imposes present-day aesthetic prejudices or historically unauthorsed concepts that a work of art should represent and how it should look .

4.2 The Preservation of Cultural Integrity and Traditional Craftsmanship

The last problem that comes across in the process of the integration of AI in the revival of Chinese sculpture is the loss of cultural ethics. Artworks enjoy the evidence of various Chinese sculptures, like religious sculptures and imperial sculptures, with presenting specific period's values, beliefs, and skills. Artificial intelligence can genuinely reconstruct or replicate these sculptures, and this may lead to misrepresentation or reinvention of these

sculptures to such a level that the basic cultural representation is forgotten. Religious sculptures are among the most fitting examples when talking about such concerns because the meaning and relevance to culture are interwoven with the given shape and material. Bronze cast carry, carving jade, and sculptural arts in stone all testify to the high level of artistry in sculpting technique that has been inherited in traditional Chinese sculpture. The application of artificial intelligence in restoration practice may improve some aspects of work; however, the skill of a real craftsman may be overshadowed. Handmade, no matter how perfect a machine can be replicated, sometimes lacks the finesse as depicted in the case of using AI in the restoration process, as it may tend to obscure the rich experience and expertise of artisans developed over several generations of craftsmanship. Also, any effort to utilize AI to copy the Chinese sculptures is questionable in today's world, especially when one is using such tools as 3D printing, and so on; the worry arises that its replicas might slowly replace or bear influence over the originals. For example, if replicas of Buddha statues created by an AI system are spread around, then it is possible that people start associating them with the original sculptures more and more, and they might end up diluting the cultural importance of the actual work. Although replicas are useful in terms of imparting the history of the original sculpture, they can never match the historicity, materiality, and truth of the originals .

4.3 Intellectual Property and Ownership of AI-Generated Artworks

The issue of intellectual property is another major ethical concern when AI is applied to restoring Chinese sculptures. Speculations: Who owns copyright on an AI-produced new creation or a digital replica of an antique sculpture? Who owns the rights to the data that has been used to recreate the sculpture with the help of AI in base with the historical data received from the. Often today, sculptors who are being 'brought back to life' through these AIs are artists whose creations are over two thousand years old. Nonetheless, the copies provided in these works—particularly, using digital models, or 3D prints, or replicas—if spaced with other original works, pose certain concerns in relation to the author and the owner. There is also a potential for various controversies with regard to ownership of AI-created artworks: an institution or a private collector may own an AI-generated reproduction, thus disputing the author's right to exploit or control the use of the replayed sculpture. Besides, if the AI model is applied for commercialization, the purpose—for example, replicas' sales or the licensing of digital images' usage—some concerns related to the

commercialization of cultural heritage would appear. The capability of AI for reproducing these relics also possibly leads to misuse of the digital copies that are produced. For instance, reconstructions made by an AI could be used to produce replicas or adaptations of cultural objects without the consent of owners or the cultural property of origin. This issue is most sensitive when the sculptures are seen as cultural property and, as such, may fall under international law or local code. In such cases, the unauthorized replication or sale of such assets through the use of artificial intelligence systems may be regarded as an infringement on cultural property rights .

4.4 The Impact on the Human Element of Art Conservation

AI solutions are aimed at increasing effectiveness and productivity, as well as at enhancing accuracy and ratio. But the part played by skilled manpower in the actual task of renovating and preserving art cannot, however, be overemphasized. When it comes to restoration, projects that are handled through artificial intelligence are usually precise by virtue of sophistication and can aid the conservators in the choice of working methodology for the particular restoration. But this reliance on technology is problematic as it can essentially marginalize the traditional objectives of conservators, who appreciate the cultural, historical, and material nature of the piece. While minimized in recent contemporary art conservation practices, human conservators, with their particularistic understanding of premodern materials, methods, and aesthetics, have been key in the sensitive return of art to its intended purpose. However, AI tools can be useful for analyzing sculptures and modeling them, but what one has to do in sculptural recognition cannot be replaced by AI tools, as it requires the input of a human who understands which material is fragile and as such requires to be handled carefully, the areas of the sculpture that need to be left intact, and when to intervene in the course of restoration. It would be unfortunate if some misinterpretation of the conservation process missed out on important details about the artwork in question; most of the artworks are symbolic as well. Moreover, AI-derived restorations are not able to incorporate the tacit, affective features that human-created restorations might preserve. A sculpture worked on by a professional human being who has conserved the sculpture instills in the artwork a level of purity that is attributed to the original artist. AI relies on data and algorithms, therefore creating replicas that, while not off in terms of accuracy, lack the human touch/interference or the underlying cultural intelligence that only human conservators can add to the mix .

4.5 Preserving the Legacy of Chinese Sculpture in the Age of Digital Reproduction

New prospects of developing interdisciplinary studies of art have emerged through the introduction of computers and AI in the work with Chinese sculpture; at the same time, it has revealed certain issues regarding the preservation of the initial tradition of sculptures. Digitalization is achieved in the present work through employing 3D scanning; possible future developments of sculptures with the help of AI modeling imply that actual sculptures can be entirely replaced with digital ones. The application of replicas, virtual avatars, or similar contributions formed with the help of AI and digital technologies might contribute to the sculptures looking relatively less important in comparison to the digital replicas (original contribution, It also leads to relevant questions that might be worthwhile to explore about how future generations visit and experience Chinese sculptures. In general, digital technologies provide more users with the opportunity to obtain knowledge concerning such pieces; in turn, the potential of the immediate contact with the actual sculptures will be considered as less important. It also involves methods beyond mere processes and techniques of copying and reconstructing works from the past era; it also requires a practical understanding of the value that all the physical artifacts depict, including their materiality, historicity, and spirituality. Therefore, the idea of applying the technology of artificial intelligence to restore communicates new opportunities for saving, restoring, and educating about Chinese sculptures. However, like many new IT technologies, it has lots of advantages but also opens a set of questions and issues of ethics. There are concerns about identity, culture, property, and the place and role of human expertise as more use of AI technologies at the heart of the preservation of cultural heritage is being progressively realized. At long last, the uses of the artificial intelligence technology in reviving Chinese sculpture will rely mainly on the proper recommendation and inclusion of technology without distorting the years of tradition in Chinese artwork.

5. CONCLUSION

The application of artificial intelligence (AI) in the restoration of Chinese sculptures means a new dawn in the rescue, restoration, and preservation of art around the world. The methods presented in this review demonstrate AI's potential for creating novel solutions to present-day problems

associated with the preservation of Chinese sculpture: the restoration of broken sculptures, the recreation of missing parts, and the creation of reproductions that allow sculptures to be more widely enjoyed by the public. The case studies presented in this paper include the digital reconstruction of Longmen Grottoes and AI-based restoration of the Terracotta warriors that AA shows it not only as a technical tool with massive accuracy but as a medium of cultural and historical importance. But as they remain central to these processes, the issue of the ethical considerations rises to the surface as well as becomes more important. Semantic questions concerning the true and false, ownership and ownership rights, and the historical and modern craft of controlling AI also arise with respect to the originality, copyright, and the safeguard of original art and heritage to avoid displacing skill, culture, and training by artificial intelligence. Also, exploring the capability of AI in refashioning art masterpieces poses a new question: How should we be innovative without offending the history that these masterpieces carry while being relatable at the same time? Finally, therefore, the renewed sense of Chinese sculpture through the use of artificial intelligence provides a brilliant chance for passing on cultural heritage. Applied and managed ethically and with great consideration to cultural differences, AI is an undisputed asset when it comes to continuity of culture and reinterpretation of the ancient artistic traditions within a vastly different context of the contemporary world.

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