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Decoding Cultural Heritage

A Critical Dissection and Taxonomy of
Human Creativity through Digital Tools

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Preface

The concept of *cultural heritage* is one of the most complex, from the point of view of architecture, art, design, and literature, to name a few leading disciplines, which contemporary times are trying to address within a convulsive and rapidly changing social context. The Krakow Charter (UNESCO, 2000), a key document for restoration, defined heritage as follows: “*It is the set of human works in which a community recognizes its specific and particular values and with which it identifies. The identification and specification of heritage is therefore a process related to the choice of values.*”

Undoubtedly, in this area, technology is relevant, both from a conceptual and instrumental perspective. The *digital tools* lead us to reflect, once again, on the triad “mythos, techné, logos,” addressed for example by Martin Heidegger (2017), which cement a possible way of understanding any produced reality. Ancestral dynamics reiterated destructive protocols of “the old,” without any brake, to erect new works, in accordance with the society of their time. At present, such dynamics are inconceivable. On the contrary, in Western Europe, consolidated criteria show that the need to preserve the remains of collective memory, of creations from earlier times, is still valid. Certainly, cultural heritage has oscillated between the extreme of disappearance and that of generalized protection, which on certain occasions was only supported by chronological and not qualitative reasons. In this historical sequence, arbitrariness is a feature that must be considered. The fire at Notre Dame in Paris revived a recurring debate around the figure of the architect Viollet-le-Duc and his restoration processes that sought to redefine, in accordance with his interpretation of the genuine spirit of the time of the great medieval constructions, all sorts of monuments. This ideological vector cleaned of additions and true historical strata, cathedrals, monasteries, giving birth to a new Gothic in the nineteenth century. The heritage underwent projects of interpretation and authentic creation, and even recreation, which sacrificed its natural becoming, sequentially natural, for the sake of a mythologized, but vigorous reality, far removed from the spirit of consolidation works such as those carried out in the Cathedral of Segovia after the Lisbon earthquake of 1755. Viollet’s maxim states that “restoring a building is not maintaining, repairing or redoing it, it is restoring it to a complete state that may

never have existed at a given time,"¹ and unequivocally it is his conviction that no civilization, in times before his, would have tried to make restorations as they were understood in the second half of the nineteenth century.² The impossibility of "raising the dead" (Ruskin, 1889, p. 194) will support the scathing criticisms³ with which his own contemporaries and his successors will attack him to the point of eclipsing his solid theoretical foundation.

The previous examples present us with a delicate panorama, which in the twentieth century acquired a new dimension in light of documents such as the Venice Charter (ICOMOS, 1964) and the, already mentioned, Krakow Charter (UNESCO, 2000), which delve into the understanding of modern architecture initiated in the Athens Charter of 1931 (CIAM, 1954). Both texts are key to architectural restoration and to understanding how society could deal with inheritances received, dynamically, and from multiple spheres, covered with a series of values filtered by the eyes of contemporary times. It is at this point where we must quote out some paragraphs of the Venetian text:

Restoration is an operation that must be of an exceptional nature. *Its purpose is to preserve and reveal the aesthetic and historical values of the monument and is based on respect for the ancient essence and authentic documents. Its limit is where the hypothesis begins:* at the level of reconstructions based on conjectures, all complementary work recognized as essential for aesthetic or technical reasons emerges from the architectural composition and will bear the mark of our time. The restoration will always be preceded and accompanied by an archaeological and historical study of the monument. When traditional techniques prove inadequate, *the consolidation of a monument can be secured using all modern techniques of conservation and construction whose effectiveness has been demonstrated on a scientific basis and guaranteed by experience.*

What happens to the restorative hypothesis if it can be developed, from contemporary times, in a precise and, at times, identical way, not only in the result but also in the registration of temporary patinas? What happens when the techniques of Consolidation have not been guaranteed by direct experience, but by the laboratory model? These considerations can be extended to painting, sculpture, music, and many other disciplines that in their day articulated a new sensibility based on technological developments, such as optics at the time. Given the challenges posed about the intervention in the heritage of the past, it became necessary to expand knowledge about it to explore and identify the possibilities of action, or not, for its conservation and restoration.

The digital realities of the twentieth century gave birth, among other events, to high-precision cartography or exhaustive material analysis, a precursor, in turn,

¹ "Restaurer un édifice, ce n'est pas l'entretenir, le réparer ou le refaire, c'est le rétablir dans un état complet qui peut n'avoir jamais existé à un moment donné" (Viollet-le-Duc, 1866, p. 14).

² "aucune civilisation, aucun peuple, dans les temps écoulés, n'a entendu faire des restaurations comme nous les comprenons aujourd'hui" (Viollet-le-Duc, 1866, p. 14).

³ "Do not let us deceive ourselves in this important matter; it is impossible, as impossible as to raise the dead, to restore anything that has ever been great or beautiful in architecture" (Ruskin, 1889, p. 194).

to other technological horizons. The development of Artificial Intelligence (AI) opens up, among other options, new ways to propose possibilities for finishing all kinds of unfinished creations. Specifically, with the recent appearance of tools such as DALL-E, capable of completing images guided by a textual description, you can count on the help of AI for recreation tasks. However, as was the case in the nineteenth century, when architects believed they were capable of deducing the right solution for unfinished projects, today, the expectations created by image completion tools seem to be leading us down paths of similar enthusiasm. The nineteenth-century conviction that it was possible to propose the correct solution to the enigma of an unfinished project (Mangone, 2018, p. 10) seems to have a second chance with Artificial Intelligence. However, the very approach of “the correct solution” presupposes an unequivocal result, alien to the natural processes of creativity, in which *pentimenti* and rectifications have always been the order of the day.

Today, different sensors collect indicators of temperature, humidity, and a long etcetera of conditions that determine the needs for preventive conservation of all kinds of artistic works. Systems that also have actuators that create atmospheres of protection that avoid the natural evolution of time are being used. A reality that today scales to all kinds of events and that effectively generates multiple data that are processed and analyzed to understand cultural heritage, from its genesis to its possible new controlled future. Point clouds, photogrammetries, reflectographies, and stylistic analysis become models, even prototypes, articulated by algorithms. Artificial Intelligence, inexorably present in our society, is colonizing all areas, from the economy to entertainment. Cultural heritage is a new enclave where critical progress is made in the knowledge of these tools and all its derivatives. The use of digital tools and techniques for cultural heritage is an emerging area in computer science that is expected to enable many new developments and applications. The book covers existing tools that have been extensively used for cultural heritage preservation, such as image processing, advanced sensing, or geomatics and for recreation such as virtual and augmented reality. The use of newer tools such as generative artificial intelligence for images and 3D or advanced natural language processing systems is also considered. The book also discusses new applications of digital tools and techniques that can be useful to better understand and preserve cultural heritage. Next, we briefly describe the contents of each part of the book.

The first part of the book focuses on how AI emerges as the final frontier in the workflow of a complex process that started decades ago, affecting heritage from various perspectives. An AI that is activated through different programs like DALL-E, but that cannot yet fully replace the designer or the critical thinking that this entails. Generative AI leads us to debate about design within a specific style and, especially, its ability to illuminate known realities, but never formally, graphically materialized in a reliable manner. This point takes us deeper into Pliny the Younger's Villa Laurentina and its virtual construction with the inherent contradictions of this process. The handling of data and the opening of an enriched dimension for

the understanding of art, in general, materialize in the Yale Collections Discovery platform experience. Above all, there is a necessary reflection on replication and the conservation of the past where the supportive capacity of AI can be crucial for a new understanding of the values of the copy versus the original from a clear contemporary reading.

The second part of the book delves into a sort of meta-history of text and its supports: How does a digital era, like ours, connect with ancestral and foundational documents, in a sense, of our cultural context? The complex conditions of support for these writings and their linguistic dimension are addressed, which, in a way, reveals the complex reality of the word as a tool, consider the prompts, key to the relationship between man and AI. At the same time, the physical papyri can be deciphered or reconstructed thanks to digital technology and AI as shown by the first passages of rolled-up Herculaneum scroll recently revealed.⁴

The third part of the book analyzes the confrontation between digitalization and the visual arts, from their conceptualization to their restorative intervention. Processes that begin, again, with data and its management to uncover possible cataloging, open and accessible, and characterizations, precise, crucial in reading styles and authors that result in complex training for AI. Perhaps the example of Goya's Black Paintings synthesizes, in a superlative manner, these operations of visual and conservational order.

The fourth part of the book addresses examples of complete digital processes from an eminently architectural context. The debate around the question of the "monument" from the perspective of Alois Riegl serves as a prelude to works in high-value heritage contexts such as the Cathedral of Segovia and the National Archaeological Museum. An application of these techniques in a vernacular world like the Cathedral of Mejorada del Campo is also possible, and there is also room for considering heritage as a field to expand through Augmented Reality (AR).

The book ends in part five with an exploration of the urban heritage reality and its ties to digital knowledge and management. The "smart" concept is presented as a new way of optimizing the conservation and management of established historical sites, but also in modern neighborhoods in need of a deep sociological analysis, supported by digital tools. New socio-environmental cartographies have been materialized at the Venice Biennale using a wide repertoire of instruments that begin with the recognition of the urban context with all the physical and technological dimensions that this implies.

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⁴ <https://www.nature.com/articles/d41586-024-00346-8>

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- Covers emerging digital techniques and applications, including generative AI and NLP applied to cultural heritage;
- Includes case studies that show the use of digital techniques in real applications;
- Provides comprehensive coverage of the latest digital techniques for cultural heritage problems.

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