

# **ETHICAL CHALLENGES OF USING ADVANCED DIGITAL TECHNOLOGIES FOR THE PRESERVATION OF CULTURAL HERITAGE**

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## **Introduction**

The widespread and growing use of advanced digital technologies (including AI), in the field of cultural heritage brings new and innovative ways of preserving and conserving cultural heritage, but also new risks for heritage, the environment, community and society including legal and ethical risks (Rouhani, 2023, pp. 1-7). Digital technologies offer numerous possibilities for exercising and enjoying human rights, but at the same time, may have the negative human rights implications. Cultural rights, intellectual property, data security, privacy, digital identity issues and surveillance are of particular concern.

## **Role of new technologies in cultural heritage preservation**

New technologies are a powerful ally in the preservation and conservation of cultural heritage. Their ability to document, restore, reconstruct, track changes over time, enhance conservation efforts, help historians and create immersive experiences redefines the way we protect, nurture and pass cultural heritage onto future generations. The possibilities opened up by ever-increasing advances in digital technologies are vast and constantly growing. From 3D technologies (3D modelling, 3D scanning, 3D visualization), to artificial intelligence (AI), Internet of Things technologies (IoT) and virtual and augmented realities (AR/VR) all of these are being used not only to ensure preservation and wide access, but also to promote awareness and appreciation of cultural heritage.

## **Understanding the ethical implications posed by digital technologies**

The use of digital technologies raises various ethical issues, including human rights, and challenges that require careful consideration. This review discusses the ethical implications of new technologies that are increasingly used in the field of cultural heritage: IoT technologies, 3D modelling, AI and AR/VR. The authors stress the importance of ethical risk assessment when using digital technology in various aspects of cultural heritage protection and point to examples of rights violations.

An application of IoT technologies in preventive conservation raises ethical issues such as unauthorized access, data breaches and potential misuses.

By using AR/VR and 3D technologies (3D scanning and 3D printing) in preservation and conservation of cultural heritage, conservation professionals face ethical dilemmas such as accuracy of digital reconstruction, decontextualization of the object, cultural appropriation, issues of access, ownership and control and trading of digital copies/models. An additional problem is that there is no legal framework to regulate trading in replicas and digital copies.

Another ethical consideration is the environmental impact of 3D printing, as it requires energy and resources to produce materials and run machines. There are also questions about the safety, durability of 3D printed structures (Wojtyła, Klama and Baran, 2017, pp. D80-D84; Cimino et al. 2018, pp. 1-6) as they have not yet been extensively tested over time. One of the important ethical issues regarding digital reconstruction is the ethical issue of transmitting wrong information. Inaccurate reconstructions can mislead the public unless they are clearly identified as such.

Meanwhile, the reconstruction of heritage that was the target of terrorist attacks opens up ethical questions concerning human security.

There is a risk that reliance on artificial intelligence could lead to the loss of traditional conservation skills and knowledge. As artificial intelligence technologies become more widespread, it is critical to ensure that they are complementary to human expertise that has long been essential to artefact restoration. In addressing these challenges and ethical considerations, collaboration among technologists, conservators, restorers, historians, and ethicists is needed. According to Gaith, the establishment of a specialized ethical framework for AI in cultural heritage conservation is critical (Gaith, 2024. pp. 5-6).

It is important to ensure that all virtual restorations and reconstructions of cultural objects are made in a way that respects the objects themselves, their cultural significance and context, and that any use of them is made with appropriate permits and in accordance with relevant laws and regulations.

### **Ethical approach to using digital technologies (ethical standards)**

When it comes to preserving and conserving our cultural heritage, ethics play a vital role. We must respect the values and beliefs related to heritage sites and artefacts. We need to think about who owns them, whether they should be returned to their original communities, and how conservation might affect local people. To make sure we're doing the right thing, it's important to have clear guidelines and integrated of human rights considerations in processes decision making (Ghait, 2024).

UNESCO has made a strongly contribution to the goal of ethical AI governance by adopting the first-ever global standard – the Recommendation on the Ethics of AI in 2021. This framework outlines values, principles, and actions that support the peaceful and beneficial use of AI technologies.

### **Conclusion**

By balancing technological innovation with ethical considerations, cultural heritage can be preserved in a sustainable and inclusive way. In order to achieve this, it is necessary to strengthen interdisciplinary cooperation and community engagement (Akyiol, and Avci, 2023, p. 99).

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### **Authors' short bio**

Mia Perković graduated in 2018 with the rector's award at the University of Dubrovnik, majoring in paper restoration and conservation. From 2019. to 2020. she works in the Protection and Storage Department of the National and University Library in Zagreb. In 2022., she is working on the preventive protection of the library of the Franciscan monastery of St. Ante in Split on Poljud, financed by "The international trust for Croatian monuments" by Lady Jadranka Beresford Pierce. In January 2023., she was employed at the Croatian Institute of Librarianship as a conservator for heritage collections with the aim of determining the condition of heritage libraries and making decisions on the nature of cultural property that serve as a basis for entry into the register of cultural property. During the previous year, she held a total of six lectures with the aim of educating librarians on the basics of preventive protection of heritage libraries.

Dragica Krstić, PhD, consultant conservator (retired 2022), is member of the council IIC Croatian group since 2022.

She graduated in chemical engineering and technology and has the doctorate in information and communication. In her working career she has worked as paper conservator-restorer in National and University Library in Zagreb, as conservation chemist in the Croatian Conservation Institute and lecturer in the Arts Academy of the University of Split. Her previous work experience also includes being head of the Natural Science Laboratory of Croatian Conservation Institute with a research interest in deterioration diagnostics and evaluation of conservation treatments and head of Preservation and Storage Department in National and University Library in Zagreb (until her retirement in 2022) with wide ranging experience in heritage protection. Today, her interest remains in the field of preservation and conservation of material heritage but more oriented on their interface with issues of management and community needs. In last decade she has been active in risk management and heritage protection in cases of various emergencies and disasters by organising many workshops, training courses, seminars, conference, and working on guidelines for protection of library materials in crisis conditions.

Denis Vokić(University in Dubrovnik, Department for Art and Restoration)

Denis Vokić has earned his MA in Arts in 2005 from University in Ljubljana, Academy of Fine Arts and Design, Department of Conservation and Restoration of Heritage. He has received his PhD in 2015 from University of Zagreb, Faculty of Humanities and Social Sciences, Department of Museology and Heritage Management. Following the apprenticeship at the Croatian Conservation Institute (1987-1992), he collaborated with the Department for Conservation of Polychromed Wooden Sculpture at the Croatian Conservation Institute in Zagreb (1992-1993), where he was employed as the Head of the Department for Conservation of Polychromed Wooden Sculpture from 1993 to 1998. He was the Head of the Department for Conservation of Panel Paintings at the Croatian Conservation Institute from 1998 to 2006. Since then, he is working as Head of the conservation studio K-R centar. From 2005 to 2015 he was an associate lecturer at the University of Zagreb, Faculty of Humanities and Social Sciences, Department for Museology and Heritage Management. He is currently an associate professor (from 2017) at the Conservation Department of the University in Dubrovnik, where he has been engaged since 2006