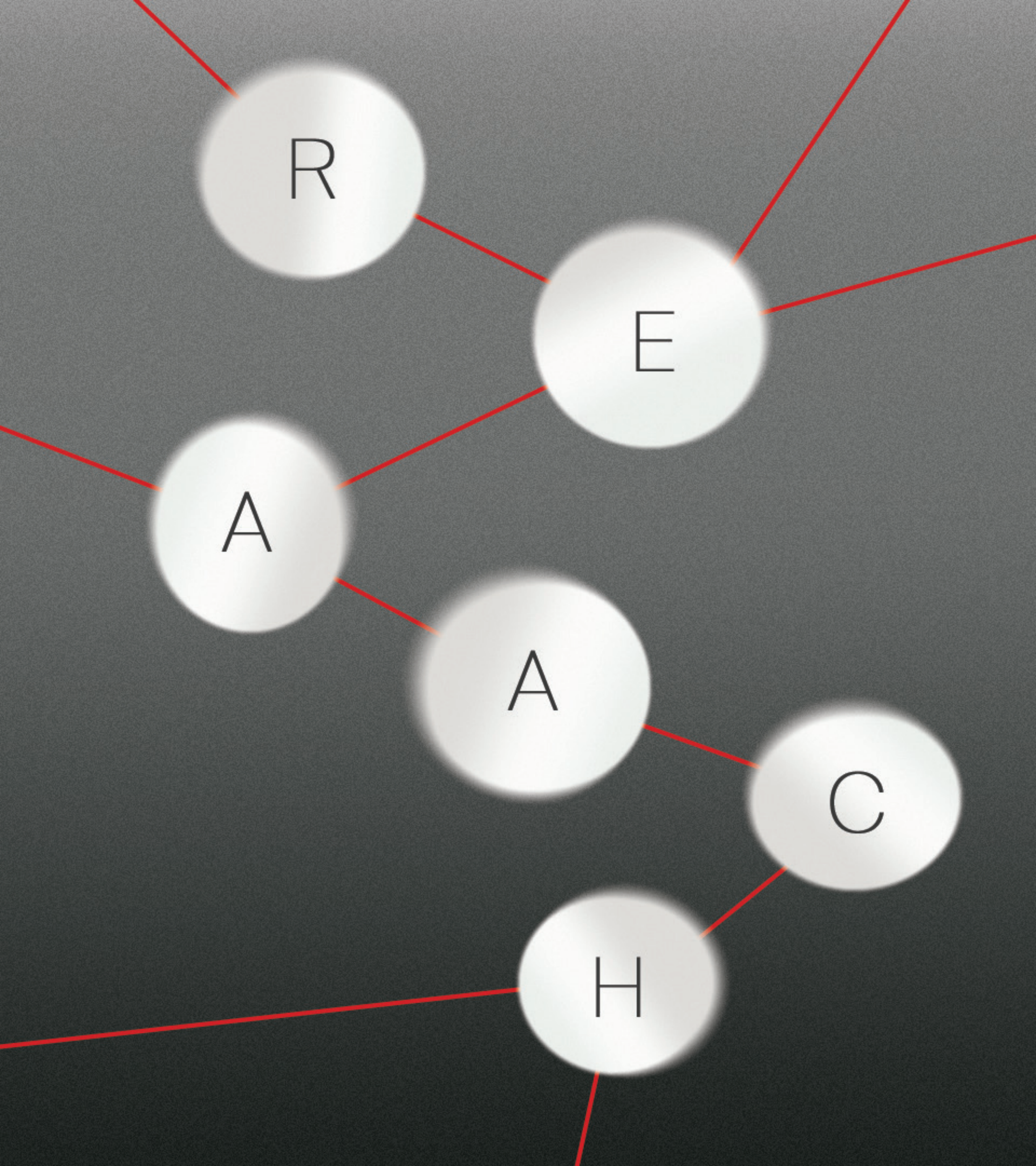




Book of Abstracts

REAACH Association
REpresentation Advances And CHallenges

REAACH Symposium 2026
7th edition

Online Symposium

13-14th October 2026

REAACH Association
REpresentation Advances And CHallenges

**REpresentation
Advances And
CHallenges**

Politecnico di Torino
Department of Architecture and Design (DAD)

Università degli Studi di Padova
Department of Civil, Environmental and Architectural Engineering (ICEA)

Sapienza Università di Roma
Department of History, Drawing and Architectural Restoration (SDRA)



with the Patronage of
Unione Italiana per il Disegno
Associazione img network aps
DAI



Promoting Committee

Andrea Giordano
Michele Russo
Roberta Spallone

Università degli Studi di Padova
Sapienza Università di Roma
Politecnico di Torino

Scientific Committee

Violetta Abergel
Salvatore Barba
Marco Giorgio Bevilacqua
Cecilia Bolognesi
Stefano Brusaporci
Valeria Cera
Pilar Chías
Francesca Fatta
Fausta Fiorillo
Andrea Giordano
Dominik Lengyel
Alessandro Luigini
Federica Maietti
Barbara Ester Adele Piga
Pablo Rodriguez Navarro
Michele Russo
Cettina Santagati
Alberto Sdegno
Roberta Spallone
Victoria Szabo
Marco Vitali
Ornella Zerlenga

MAP UMR 3495 CNRS/MC, Marseille
Università di Salerno
Università di Pisa
Politecnico di Milano
Università degli studi dell'Aquila
Università degli studi di Napoli Federico II
Universidad de Alcalá, Madrid
Università degli Studi Mediterranea di Reggio Calabria
Politecnico di Milano
Università degli Studi di Padova
BTU Brandenburg University of Technology Cottbus-Senftenberg
Libera Università di Bolzano
Università di Ferrara
Politecnico di Milano
UPV Universitat Politècnica de València
Sapienza Università di Roma
Università degli Studi di Catania
Università degli Studi di Udine
Politecnico di Torino
Duke University
Politecnico di Torino
Università della Campania “Luigi Vanvitelli”

Organising Committee

Martina Casciola
Giulia Flenghi
Fabrizio Natta
Valerio Palma
Enrico Pupi
Martina Rinascimento

Sapienza Università di Roma
Sapienza Università di Roma
Politecnico di Torino
Shazarch s.r.l.
Politecnico di Torino
Politecnico di Torino

Index

07 Structuring and Exploring Cultural Heritage Data at Multiple Levels of Detail

Ait Addi-Russier Marwan, Gesquière Gilles, De Luca Livio, Abergel Violette

08 Representing Displacement-Exposure: Spatial Visualisation of Short-Term Rental Concentration in Six Intermediate Italian Heritage Cities

Amaral Gustavo, Carota Francesco

09 From damage segmentation to risk-informed digital models: an integrated AI-BIM approach for building façades

Antuono Giuseppe, Nicoella Maurizio, D'Agostino Pierpaolo

10 Paper Horizons: Inventing the Mediterranean through Comics and AI

Arena Marinella, Lax Gianluca, Mercurio Sonia

11 Tools and methods for the knowledge and valorization of bastion systems. The tenaille of San Pancrazio in Cagliari

Argiolas Raffaele, Pirinu Andrea, Sanna Giancarlo

12 From Hazard Maps to GenAI Representation: Visualising Risk for Citizen Preparedness

Aschieri Davide, Gardella Federica Joe

13 Space, body, knowledge: spatial navigation and embodiment for the dissemination of historical collections of wooden models for structural engineering

Bocconcino Maurizio Marco, Vozzola Mariapola, Semis Larisa

14 Peeling Back Layers: An AR Approach to Historic Building Recognition

Bolognesi Cecilia, Balin Simone

15 Semantic-Driven Augmented Reality for Intelligent Facility Management: BIM-IoT Integration towards a Building Digital Twin

Bongini Andrea, Biagini Carlo

16 AI semantization for parametric modeling

Brusaporci Stefano, Maiezza Pamela, Tata Alessandra, Pecilli Davide

17 DIGITAL UPCYCLING. Computational methodologies for industrial reuse

Buratti Giorgio

18 Digital Byōbu. Interactive Interfaces and New Forms of Access to Japanese Museum Heritage

Calandriello Antonio, Cazzaro Irene

19 From static storyboards to temporal representation: AI-generated video and the critical role in cultural heritage

Caldarone Adriana, Empler Tommaso

20	From Language to Form: Traceability, Persistence and Multimodality in LLM-Assisted Modelling Paradigms Calvano Michele, Cognoli Roberto	27	Space, body, knowledge: spatial navigation and embodiment for the dissemination of historical collections of wooden models for structural engineering Farroni Laura, Mancini Matteo Flavio, Tabellia Giorgio, Caporossia Claudia Valeria, Ippoliti Elena, Palestini Caterina, Rasetti Giovanni, Pagano Alfonsina, Fanini Bruno, d'Annibale Enzo
21	Augmented Heritage Learning: An Experience for Enhancing Cultural Accessibility through AI and AR Cera Valeria	28	Environmental Dark Patterns: Extending Deceptive Design Theory to GenAI XR Spaces Ferro Lauren S., Thandub Nagaraju, Greuter Stefan
22	Muography in Deep Digital Twins for Cultural Heritage Corradetti Daniele, Costa José Paulo	29	Semantic-Driven Augmented Reality for Intelligent Facility Management: BIM–IoT Integration towards a Building Digital Twin Fiorillo Fausta, Achille Cristiana, Fassi Francesco, Novati Park Muguetta Rossella
23	AI-Assisted Representation for the Critical Reconstruction of Lost Heritage Cozzolino Francesco, Lanzara Emanuela	30	From Static Catalogues to Dynamic Cultural Environments: An Agent-Based Framework for Relational Discovery in Cultural Heritage Flenghi Giulia, Réby Kévin, De Luca Livio, Russo Michele
24	From geometry to cognition. The evolution of architectural heritage management from pre-AI tools to semantic knowledge graphs Delgado-Martos Emilio, Carlevaris Anna Laura, Intra Sidola Giovanni, Hidalgo Arellano José Ángel, Pardo de Santayana Castro Carmen, Fernández Temprano Lucas, Sánchez Soriano Javier	31	Assessment of 3D Gaussian Splatting reconstruction quality from still frames versus 360-degree video acquisitions: the Osservanza complex in Imola Foschi Riccardo, Gaeta Benedetta
25	Performative Empathy in Design Thinking Education: When Students Learn the Language of Reflection Donmez Hayriye, Guvenir Can, Ozkurt Nalan	32	UX as a representation strategy. An immersive experience for Lorenzo Lotto's wooden inlays Friso Isabella, Casarano Gabriele, Amato Arianna
26	Immersive Inclusion or Digital Hegemony? AI-XR Convergence, Representation, and Technological Sovereignty in Higher Education Durante Tommaso	33	ABITA (AI-driven Built-heritage Immersive Three-dimensional Architecture): From Layered Parallax to Volumetric Reconstruction in a Neuro-Classical Pipeline for Painting Exploration Ganciu Amedeo

34	Enhancing Mathematical Heritage through Parametric Modelling Garozzo Raissa, Guardo Elena, Santagati Cettina	41	From Access to Reuse: AI-Assisted Analysis of 3D Cultural Heritage Metadata in Europeana Marcantonio Chiara, Maietti Federica
35	Leveraging Laser Scanner Intensity data for Conservation-Oriented Semantic Segmentation of Historic Masonry Point Clouds Giau Gabriele, Maietti Federica, Pritchard Douglas	42	Representing Bioresponsive Design: AI-XR Perspectives for Computational Biophilic Environments Meraviglia Matteo, Rossi Michela, Nebuloni Attilio
36	From Massive LiDAR Capture to Multi-Level Immersive XR: A Dual Virtual Reality Workflow for the Digital Documentation of Viboldone Abbey González David Marcos, Tordesillasas Antonio Álvaro, Fiorillo Fausta	43	From Orienteering to Augmented Reality. Co-designing an AI-Assisted Exploratory Geogame for Heritage Education in Bozen Nicastro Giuseppe, Luigini Alessandro
37	Augmented Reality for the Visualization of Funerary Hypogean Heritage Itri Federica	44	ChAiR Interactive Mobile AR for Flexible Furniture Visual Prototyping Özder Onurcan, Russo Michele
38	Protocols for Controlling and Qualifying Diffusion Models in Cultural Heritage Reconstruction Laroche Florent, Vilain Ambre, Vauxion Mathis, Le Chenadec Elouarn	45	Generative AI for Photogrammetric Orthophotos: A Workflow for Enhanced Architectural Representation Balancing Visual Quality and Metric Reliability Perticarini Maurizio, Condorelli Francesca
39	Mixed Reality between East and West: the case study of “Prosperous Suzhou” handscroll Lazzaretto Giulia	46	From Descriptive HBIM to Cognitive Digital Twins: AI-Driven Decision-Making for Built Heritage Ramos-Martin Manuel, del Blanco-García Federico Luis
40	Generative Rendering through Color Coding for Precise Material Substitution in Image Editing Models Lis Mateusz Miroslaw	47	Accessibile digital heritage. Alternative descriptions for images and semantic similitude mapping using AI models Rechichi Piergiuseppe, Branca Iole

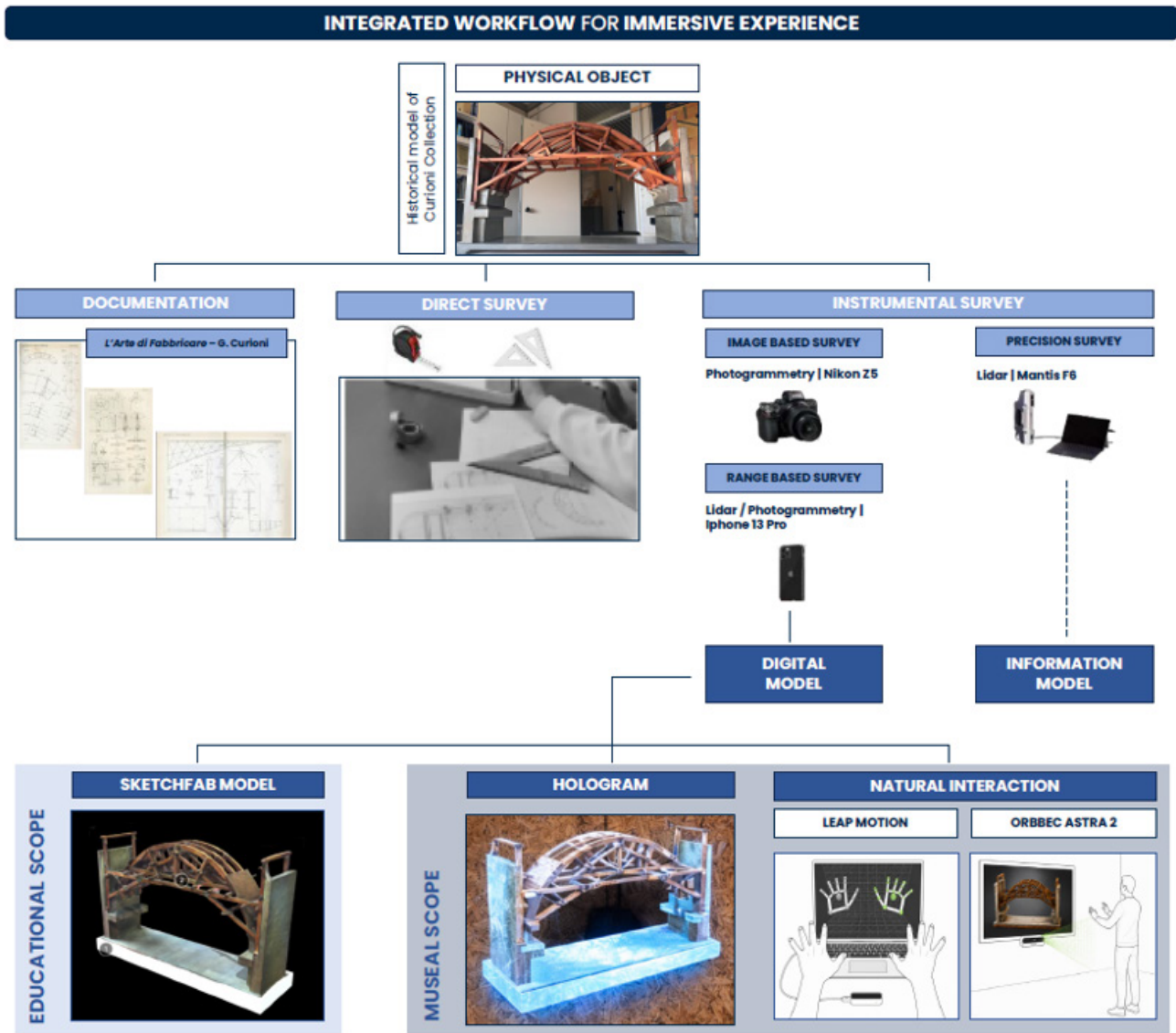
48	Evaluating Image-Based 3D Gaussian Splatting for Heritage XR: A Comparative Workflow Integrating UAV Photogrammetry and Segmented 360-Degree Videography Rodriguez-Navarro Pablo, Gil-Piqueras Teresa, Ruggieri Andrea, Spallone Roberta, Pupi Enrico	55	Best Practice for Creating Knowledge-sharing Experiences using Low-cost AR Technologies Spallone Roberta, Vitali Marco, Palma Valerio, Natta Fabrizio, Rinascimento Martina, Gasparini Michele Mario
49	Survey-Based Documentary Grounding for AI-XR Experiences in Non-Visitable Cultural Heritage Saccucci Marco, Russo Ciro, Marrocco Claudio, Pelliccio Assunta	56	Exhibition strategies for the Museum of Decorative Arts at the Kulturforum in Berlin combining digitality and materiality Spinelli Jacopo, Lengyel Dominik
50	Visualizing the Untouchable: A Philological Approach to 3D Interactive Reconstruction of H.P. Lovecraft’s Innsmouth Sartore Francesco, Monteleone Cosimo, Szabo Victoria	57	Artificial Intelligence in Professional Architectural Practice: Adoption Patterns and Strategic Integration Stancato Gabriele, Jabbour Robert
51	Student–Large Language Model Dialogue on Representation Senatore Luca J., Leggeri Davide	58	Representing Forest Ecosystems through Digital Twins and AI Stancato Gabriele, Piga Barbara E.A.
52	Artificial Intelligence for the Tracking of Intangible Phenomena Senatore Luca J., Aveta Marco, Ippoliti Elena	59	Representing Heritage Beyond Geometry: An Ontology-driven Digital Twin and XR Environment for the Monza Expiatory Chapel Stefanone Alessandro, Fioretto Elena, D’Uva Domenico, Bolzon Gabriella, Colombo Giorgio, Galli Barbara, Xu Duo
53	AI-Driven Generative Workflows for the Digital Representation of Archaeological Museums Shuai Zhangliang, Bevilacqua Marco Giorgio, Caroti Gabriella, Piemonte Andrea, Capriuoli Federico	60	Responsible Agentic AI as a Problem of Representation: An Auditable LLM Tutor for Extended-Reality Safety Training Ugliotti Francesca Maria, Daud Muhammad
54	Virtual Reconstruction and Digital Storytelling for Immersive VR Experience: The Rituals in the Temple of Mut Spallone Roberta, Lamberti Fabrizio, Auenmüller Johannes, De Lorenzis Federico, Rinascimento Martina, Bortoluzzi Beatrice	61	On the edge of a tabu: Artificial Intelligence intelligent uses for reconstructing and reconstruction from historical fragmented artworks Verdiani Giorgio, Charalambous Alexia, Pasquali Andrea

Space, body, knowledge: spatial navigation and embodiment for the dissemination of historical collections of wooden models for structural engineering

Bocconcino Maurizio Marco, Vozzola Mariapaola, Semis Larisa

Politecnico di Torino, Turin

XR
3D Modelling
Mixed Reality
Natural Interaction
Inclusive Accessibility



In recent years, the digitisation of cultural and academic heritage has gradually shifted from the simple development of static three-dimensional models towards the creation of interoperable and dynamic information ecosystems, capable of integrating diverse data to support preventive conservation, research and public outreach (Cerullo et al, 2023). In this context, the Curioni Collection of wooden models, commissioned by Professor Giovanni Curioni, lecturer in civil engineering at the Royal School of Engineering Practice (Bocconcino et al, 2023), represents today a strategic resource in both teaching and research, but also a starting point for engaging diverse audiences, in line with the objectives of knowledge enhancement and transfer inherent in the university's third mission (Bocconcino et al, 2023). The proposed research forms part of a wider research project, the initial phases of which focused on defining an integrated process for the surveying, representation, documentation, digitisation (Bocconcino et al, 2023) and access to these artefacts through photogrammetric acquisition techniques, geometric optimisation of digital models, data structuring and online publication (Bocconcino et al, 2023), utilising interoperable and accessible platforms for three-dimensional visualisation, such as the Sketchfab web-based sharing platform. During the second phase of the research, a mixed reality prototype was developed for the interactive exploration of digital models. The system was implemented within the TouchDesigner software environment, configured to receive and process tracking data from the Leap Motion Controller. During the second phase of the research, a mixed reality prototype was developed for the interactive exploration of digital models. The system was implemented within the TouchDesigner software environment, configured to receive and process tracking data from the Leap Motion Controller. The integration of immersive environments and natural interaction paradigms enables users to interact with digitised heritage through gestures performed in space, fostering immersive, inclusive and contactless learning experiences (Pietroni et al., 2021). Thanks to its high precision in tracking hands and fingers, the Leap Motion has, from the outset, enabled the manipulation of virtual models without the use of physical input devices. However, the sensor's limited operational area, characterised by a small capture volume, restricts the user to a largely static position and confines interaction to hand movements alone (Guzsvinecz et al., 2019), for this reason, new interaction environments have been investigated, including the Orbbec Astra 2 depth camera. Unlike Leap Motion, which focuses primarily on hand tracking, the depth camera sensor captures three-dimensional information relating to the user's entire body and the surrounding space, generating a continuous depth-based representation (Guzsvinecz et al., 2019). This technological transition makes it possible to move beyond the concept of simple gestural manipulation, introducing modes of spatial interaction based on bodily movement and on the relationship between the user, the physical environment and digital content. The proposed approach aims to enhance the sense of embodiment – understood as the user's perception of physical and spatial integration within the digital system (Gallagher, 2020) – thereby fostering immersive experiences that are particularly effective in museum and exhibition settings. Through natural body movements, visitors can navigate, interact with and explore three-dimensional models without resorting to physical devices or traditional interfaces, thereby reducing technological barriers and broadening accessibility to an audience with varying levels of digital literacy. The research therefore explores the shift from direct manipulation to spatial navigation as a strategy for enhancing inclusivity, engagement and participation. The ultimate aim is to demonstrate how the integration of AI-XR technologies, depth sensors and digital models of cultural heritage can transform three-dimensional representation into a genuine cognitive interface, capable of supporting experiential learning and the shared construction of knowledge.

[1] Bocconcino, M. M., Vozzola, M., Pavignano, M. (2023). Il Disegno nelle strategie per la valorizzazione e l'accessibilità del patrimonio museale universitario: la collezione Curioni del Politecnico di Torino. In A. Sdegno, V. Riavis (a cura di). Il Disegno per l'Accessibilità e l'Inclusione. Atti del II convegno DAI, Udine 1-2 dicembre 2023, pp. 200-212- Alghero: PUBBLICA.

[2] Cerullo, L., & Negri, A. (2023). L'infrastruttura software per il patrimonio culturale (ISPC) come abilitatore di un Ecosistema digitale nazionale del patrimonio culturale. DigItalia, 18(1), 38–50.

[3] Gallagher, S. (2020). Action and interaction. Oxford University Press.

[4] Guzsvinecz, T., Szucs, V., Sik-Lanyi, C. (2019). Suitability of the Kinect Sensor and Leap Motion Controller – A Literature Review. Sensors, 19 (5), 1072.

[5] Pietroni, E., Pagano, A., Biocca, L., Frassinetti, G. (2021). Accessibility, Natural User Interfaces and Interaction in Museums: The IntARSI Project. Heritage, 4, p.567-584. <https://doi.org/10.3390/heritage4020034>.

REAACH Association
REpresentation Advances And CHallenges

<https://www.reaach.eu/>

