Archeologia e Calcolatori
36.2, 2025, 11-13
doi 10.19282/ac.36.2.2025.02

INTRODUCTION

Venice's extraordinary wealth of documentary archives, architectural monuments, and artistic legacy provides a fertile ground for exploring historical networks and cultural dynamics. At the same time, the city's layered complexity presents challenges for traditional methods of historical and archaeological inquiry. This thematic section of the journal brings together contributions from scholars across disciplines to investigate how the application of quantitative methods and network analysis can transform our interpretations of cultural heritage and historical data.

At the heart of this section is the belief that quantitative methodologies – ranging from network analysis and spatial modeling to digital mapping and machine learning – offer crucial innovations for the study of cultural heritage. These tools enable scholars to manage and interpret vast datasets, visualize complex historical connections, and address questions that would otherwise remain inaccessible. Venice, with its dense archival records and enduring artistic tradition, offers an ideal testing ground for such methodologies. By engaging with these new tools, the studies collected here demonstrate how the integration of quantitative approaches and traditional humanities scholarship can generate fresh insights into the cultural heritage of the past.

The structure of this section reflects both the diversity of methodologies employed and the richness of the case studies investigated. The opening chapter, *The New Science of Long Data* by Guido Caldarelli and Alessandro Codello, introduces the concept of 'Long Data' – a framework that emphasizes the deep historical context embedded in meticulously preserved archival records. Using artificial intelligence and data modeling techniques, the authors explore how this approach can revolutionize the study of Venice's State Archive (ASVe), one of the world's most extensive and historically significant collections. By harnessing new technologies in harmony with traditional archival methods, Long Data enables the analysis, transcription, and modeling of historical information on an unprecedented scale, paving the way for innovative insights into social and cultural evolution.

The subsequent chapters delve into specific applications of quantitative methods in archaeology and art history. Paolo Carafa, Niccolò Cecconi, and Francesco Di Stefano's contribution on the CHANGES Project emphasizes the importance of integrated advanced technologies in promoting sustainable heritage management. Their work illustrates how geolocated data and interdisciplinary collaboration can transform fragmented historical information into cohesive systems of knowledge. The case studies from ancient *Latium*, Amendolara, and Syracuse demonstrate how data-driven

approaches foster a more systematic inventory, classification, and dissemination of cultural assets.

The volume also includes studies focused on digital modeling and the reconstruction of lost heritage. Indeed, George Bruseker, Kathleen Christian, and Denitsa Nenova discuss recent innovations in the *Census of Antique Works of Art and Architecture Known in the Renaissance*, a long-running research project established in 1946 that traces the knowledge and reception of antiquities during the Renaissance by linking them with early modern visual and textual records. Over its history, it has evolved from an analog system to one of the earliest digital art history projects and now to an online database. Recent innovations (2021-2023) have transformed the database into semantic data using the CIDOC-CRM ontology, aligning it with FAIR principles and encouraging broader engagement with its rigorously-researched dataset. By using the X3ML language and the 3M tool for mapping and verification, the database ensures consistency and compatibility with other datasets, such as those in the CORDH network. This semantic transformation opens new avenues for research, enabling advanced queries through SPARQL and extending the database's utility beyond its original scope in art history and archaeology.

In addition, the 'Sacra Absentia' project, presented by Simone Piazza and Giulia A.B. Bordi, documents the lost furnishings of medieval Venetian churches, using archival documents, historical texts and iconographic evidence to compile a comprehensive database. The interactive map system developed for this project offers an essential tool for reconstructing the original appearance and historical context of these sacred spaces, with a particular focus on the church of Sant'Agnese. The chapter on the church of San Fantin in Venice by Carlotta Zaramella, Myriam Pilutti Namer and Giulia A.B. Bordi similarly combines digital modeling, archival research, and material analysis to reconstruct the building's architectural evolution and its reuse of ancient marbles, highlighting the significance of spolia in the city's material culture. The article by Ruggero Longo and Elisabetta Scirocco explores the integration of quantitative methods and digital approaches in art historical research, focusing on the 'Mapping Sacred Spaces' project investigating medieval sacred architecture in southern Italy. It emphasizes the need to reconcile scientific and humanistic disciplines through data-driven analysis, digital tools, and interdisciplinary collaboration for more accurate reconstructions.

Innovative digital methodologies also play a key role in the study of architectural heritage beyond Venice. Carlo Bianchini and his co-authors explore the church of San Lorenzo in Miranda in Rome, demonstrating how tools like GIS, BIM, and integrated large-scale surveys can foster a more accurate understanding of ancient structures and their transformations. This approach underscores the importance of shared digital infrastructures and open-access policies in cultural heritage research, enabling the integration

of heterogeneous data and the development of interoperable systems that connect historical, architectural, and graphic sources.

Finally, the section turns to the application of advanced scientific techniques for the analysis of artworks. The study of the painting *Saints Peter and Stephen* at the Fondazione Giorgio Cini by Mauro Missori and his co-authors showcases the potential of remote reflectance spectroscopy to identify pigments and material choices while preserving the integrity of fragile artworks. This non-invasive method, inspired by astronomical techniques, offers new insights into the artist's material practices and demonstrates the feasibility of remote diagnostic tools in heritage science. As a final contribution, Myriam Pilutti Namer's review of two recent volumes on archaeological network research underscores the current state of the field and situates the discussions within broader theoretical and methodological debates.

Together, these contributions illustrate the transformative potential of quantitative methods and interdisciplinary collaboration in the study of cultural heritage. By embracing innovative approaches and fostering dialogue across disciplines, this thematic section aspires to provide valuable models for heritage research on a global scale.

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