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# Digital Humanities, Education and Cultural Heritage across Academic and Museum Settings

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## ABSTRACT

The wide variety of research practices described as Digital Humanities are unified by their emphasis on creating, connecting, interpreting and collaborating. In the last decade the relationship between technology and the humanities has grown significantly transforming itself into something of a symbiosis. Being aware of the humanities' capability of evolving as a discipline by using technological knowledge to reach a wide and varied audience, the Humanities Department (DSU) community at Roma Tre University founded the Digital Humanities Working Group and Laboratory in 2018 in order to promote transdisciplinary collaborations among the academic and museum environments, with the aim to reach a wider public and create contents available for cultural heritage fruition, enhancement, and preservation. The DH Lab is currently developing or participating in wider research projects, such as *VR Sant'Agnese*, *Petrarch's ITINERA* and *LiLeo Digital Atlas*, which focus on the creation and presentation of cultural heritage resources to a wider public, in collaboration with prominent cultural organizations and museum institutions. These projects showcase the ability of Digital Humanities to challenge all disciplines of Art History, Curatorial, and Preservation Studies ultimately to engage with new interdisciplinary methodologies, innovative technologies, and original approaches to pedagogy.

## KEYWORDS

Infosphere, Digital education, Digital public humanities, Digital humanities and traditional tools, Cultural heritage preservation, Academic and museum settings, transdisciplinarity.

## 1. INTRODUCTION

The increasing diversification and specialization in the analysis of literary, artistic and scientific sources has favoured the birth over the last century of multiple disciplines focusing on projects in the fields of either Italian Studies, Art History, or Computer Science. Wholly transdisciplinary research is still needed to initiate dialogue about these disciplines, as the recent rise of Digital Humanities initiatives and laboratories testifies. Often considered just as technical tools applied to humanistic thought, Digital Humanities offer the unique opportunity to introduce a common methodological vision in the context of the more established literary-artistic and technical-scientific studies. Moreover, Digital Humanities projects are a social enterprise that favour inclusivity and dissemination of research (Kirschenbaum 2010; Foster 2011).

Indeed, the phrase Digital Humanities describes the humanities in the plural. But, as heterogeneous as it is, Digital Humanities is unified by its emphasis on creating, connecting, interpreting and collaborating (Burdick, et al. 2012). DH is concerned not only with the use of digital technology for humanities projects, but also with how the use of digital technology for humanities projects changes the user experience. We are convinced that this sector is not only interesting, not only culturally and artistically relevant, not only of great potential for increasing the audience of museums, touching people who, thanks to certain technological shortcuts, will be able to stop considering cultural experience as something detached from itself. We are convinced that this sector is something more: that it is strategic for the country as a system (Tonelli 2017).

In the last decade the relationship between technology and the humanities in contemporary society has grown significantly transforming itself into something of a symbiosis. In time, the humanities have been capable of evolving as a discipline using technological knowledge to reach a wide and varied audience (Soncini 2008). The synergy that exists between technology and humanities has also been brought to the university by promoting exchange and dialogue between different Departments. We may go as far as saying that the synergy between the departments together with the accessibility brought by the interaction of the humanities and technology has made the university a more inclusive, democratic and globalized pole. For example, in the field of Art History, the DH were born to unite and share knowledge on medieval artistic artifacts which are often of difficult interpretation and complex to explain. The Nasher Museum Project attempted to integrate detached fragments of architecture into a virtual space that would restore its original function. We may go as far as saying that the Discipline has left the academic circle – to join societal needs for change and inclusivity (Pinotti 2016).

Italy is among the leaders in the field of Digital Cultural Heritage, or the use of cultural heritage through the use of new technologies. Exhibitions and multimedia events are now a fundamental driver in the field of edutainment. Cultural heritage breathes a new life with digital technologies. Institutions can reach a wider audience, and develop creative and accessible content for the enjoyment, enhancement and conservation of cultural heritage (<https://ec.europa.eu/digital-single-market/en/digital-cultural-heritage>). Following the new direction in Digital Cultural Heritage promoted by the European Commission, the Humanities Department (DSU) community at Roma Tre University, under the direction of Professor Manfredi Merluzzi, founded the Digital Humanities Working Group and Laboratory in 2018 in order to promote transdisciplinary collaborations among the academic and museum environments, with the aim to reach a wider public and create contents available for cultural heritage fruition, enhancement, and preservation. DH projects inside the University were selected by the lab in accordance with best practice research standards as a methodological benchmark for future investigations in the field. These include but are not limited to meticulous study of primary sources, attentive scrutiny of extant artefacts, factual display of 3D reconstructions. Indeed the objective of these projects is to use new digital tools in a broader setting, with the scope of reaching broader and diverse users to breach the gap between specialised investigators and laymen. This holistic methodology will hopefully democratise the humanities fostering e-equality, participation, rights and values in the digital age.

## 2. THE ROMA TRE DIGITAL HUMANITIES LAB

The Digital Humanities Laboratory (DH Lab) at Roma Tre University merges new approaches in the digital humanities with traditional object-based research, by promoting a broad range of interdisciplinary projects and initiatives at the core of the Humanities Department mission. From the onset of the lab's foundation a dialogue was initiated between different research branches inside the Department. The Roma Tre DH Lab supports collaborative work across different departments and divisions, such as the Cultural Heritage, Art and Literature, Engineering, History, History of Science and Geography Laboratories, and is equipped with a multimedia archive for both research and teaching in the Digital and Public Humanities. After hosting prestigious initiatives, such as the web portal *ALI* ([www.autografi.net](http://www.autografi.net))<sup>1</sup>, the DH Lab is currently developing or participating in wider research projects which focus on the creation and presentation of cultural heritage resources to a wider public, in collaboration with prominent cultural organizations and museum institutions.

The current research strands of the Roma Tre DH Lab are represented by three projects, namely, *VR Sant'Agnese: The Virtual Reconstruction of a Medieval Monastery* in collaboration with RiITec laboratory, Department of Architecture; *Petrarch's ITINERA: Italian Trecento Intellectual Network and European Advent*, which is a part, based in Roma Tre, of a PRIN National research led by Siena University, and *LiLeo Digital Atlas: Leonardo Word-and-Image Digital Editions*, developed in collaboration with the Museo Galileo in Florence. Each of the DH Lab representative projects use model open source, web based, and interoperable technologies.

In particular, *VR Sant'Agnese* expands traditional building drawing design by incorporating digital visualization software tools to transpose the 2D drawing into a 3D Virtual Reality space rendering; *Petrarch's ITINERA* employs Cadmus and Semantic Web to catalogue and track the movements of the poets' correspondences thus transforming the written word into web semantic diagrams; *LiLeo Digital Atlas* experiments with Omeka, Project Mirador, and IIIF to collect, annotate, and share original sources, and employs abstract models, which are the product of scholarly interpretation, to build a database of patterns, by emphasizing and making them explicit<sup>2</sup>.

*VR Sant'Agnese*, *Petrarch's ITINERA* and *LiLeo Digital Atlas* are highly interdisciplinary projects, which are developed by a team of international scholars specialized in either textual, visual, and scientific fields of investigation, web designers and developers, library science technical staff, and research assistants with experience in Digital Humanities,

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<sup>1</sup> ALI is a web portal for the study of the autographs of Italian writers from the Origins until the end of the sixteenth century. The portal is the result of the work of literary historians, philologists, historians of language, paleographers, librarians and archivists.

<sup>2</sup> Omeka is a free open source web-publishing platform for sharing digital collections and creating media-rich online exhibits in library, museum, archive, and academic settings (<https://omeka.org/>). Project Mirador is an open-source, web based, multi window image viewing platform with the ability to zoom, display, compare, and annotate images belonging to different repositories (<https://projectmirador.org/>). IIIF (International Image Interoperability Framework) is a growing community of the world's leading research libraries and image repositories, which collaborate to produce an interoperable technology and community framework for image delivery. IIIF provides uniform and rich access to image-based resources hosted around the world; it also develops interfaces that support interoperability between image repositories and technologies for viewing, comparing, manipulating and annotating images (<https://iiif.io/>).

information studies, and computer science. A distinctive feature of these initiatives is their user-centricity and educational output and implications.

Being aware of the fundamental role that DH has in education, we encourage students to participate in the life of the DH Lab, by collaborating on these projects as academic assistants under the direction of the technical staff. For instance, students have been involved in data collection and organization of the image files to be included in the *LiLeo Digital Atlas*, and in the creation of derivative images containing selected texts and pictures from the original files, and spreadsheets for tracking project metadata and for bulk upload of items to the digital database. In addition, students of the Renaissance Literature course (MA) will use Cadmus to catalogue part of Petrarch's correspondence to be included in the *ITINERA* database. Under the direction of the community of scholars and specialists from Roma Tre and partner institutions, students could learn technical skills to apply to their future work and could also serve as an ideal audience for the projects themselves. In this way, Digital Humanities creates a bond between universities and cultural institutions, such as the Galileo Museo in Florence, and the National Museum of Science and Technology "Leonardo da Vinci", where students could conduct professional work during the 2019 Roma Tre Digital Humanities Summer School edition.

By stimulating differentiated and active learning both inside and outside of the class (e.g. the museum environment), Roma Tre DH Lab projects enhance the variety of current students' educational and cultural backgrounds and skills. Student collaborations in the DH Lab projects are always linked to the courses and workshops which are part of their study plan, and therefore perfectly integrated in their academic curriculum. In this perspective, *Petrarch's ITINERA* would be the preferred environment for students to interpret some of the primary sources and cultural context of the Italian Literature course and the seminars on the poet. Thanks to the comparative analysis and interactive maps tools students would be able to interpret and connect different texts, and to track the paths of writers and their correspondences across time and space. Furthermore, participation in international academic and public institutional projects constitutes an invaluable experience for knowledge growth and civil awareness of students, which are faced with the public uses of history and culture. In this way, student learning is modelled on the problems and aims of Public and Digital History and not on a simplistic competence-based approach. We hope that research projects like *VR Sant'Agnese* may foster the future involvement of students, to physically interact with the architectural spaces that they study in their art history classes, and visualize their function and implications thanks to object-based spatial analysis and 3D virtual model reconstruction.

### 3. CONCLUSION

The presentation of the current research strands of the Roma Tre DH Lab have shown that Digital Humanities offers multiple tools for data visualization and examination, which allow to question historical research on multiple levels, and encourage different possibilities of making use of history. In addition, digital and public history research and learning initiatives facilitate cultural heritage preservation and fruition, and open culture circulation. We believe that the ongoing projects undertaken at the Lab showcase the ability of Digital Humanities to challenge all disciplines of Literature, Art History, Curatorial, and Preservation Studies ultimately to engage with new interdisciplinary methodologies, innovative technologies, and original approaches to pedagogy. Digital imaging, manuscript encoding and visual annotation tools – including 3D Modelling, Virtual/Augmented Reality and Image Interoperability Framework Viewer – revolutionize our critical engagement with the arts and the humanities in both the academic and museum environments. This agenda has deeply influenced the museum world with new innovative projects that catalyzed the need for inclusivity and dissemination.

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## APPENDIX: ROMA TRE DIGITAL HUMANITIES RESEARCH PROJECTS

**VR SANT'AGNESE.** *VR Sant'Agnese: The Virtual Reconstruction of a Medieval Monastery* combines established tools of scholarly enquiry including but not limited to archival research, empirical display of extant objects, and meticulous study of building structures with photogrammetry/point cloud, building information modelling and virtual reality. This project aims to reconstruct the medieval facies of the monastery of Sant'Agnese fuori le mura in Rome in an integrated study of architecture, liturgical furnishing and painting. The transformation of physical spaces over time was originally approached through traditional building design, largely reliant upon two dimensional technical drawings (plans, elevation, sections). Building information modelling extends our understanding of art and architecture by augmenting the three primary spatial dimensions (width, height, and depth) with time. The instalment of female communities in existing structures, the loss of a significant number of convents, and the perishable nature of the materials used has frequently impaired the study of female monastic architecture. When it comes to women religious fixed architectural schemes cannot be traced on the basis of surviving elements.<sup>3</sup>

Starting from the pioneering experience of the *Atlante percorsi visivi (La pittura medievale a Roma. 314-1431)* by Maria Andaloro, aimed at recontextualizing murals and mosaics in the churches of Rome with the help of floor plans and axonometric views, recreating specific architectural contexts, this study aspires to a precise spatial analysis that goes beyond the descriptive limit of photographic reproductions.<sup>4</sup> By creating a 3D virtual model of the monastery in its late medieval facies, this application aims to be both a research tool and aid to visiting the monument (Figure 1).<sup>5</sup> Ultimately, the outcome of this project will be to engage with architectural history with both new and traditional methodologies, by challenging the way we study and visualize the change of space over time. In addition to publishing our findings, we intend to create an open access platform which will allow to download these immersive digital environments. The greater/future scope of this project is to both track the benefits in pedagogy of multiple users in a 3D virtual reality medium, which in many fields have already replaced two-dimensional flat screen teaching, and to study the impact of digital reconstructions in relation to the dissemination of cultural heritage to impaired visitors.<sup>6</sup>

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<sup>3</sup> Zappasodi, Emanuele. *Sorores reclusae. Spazi di clausura e immagini dipinte in Umbria fra XIII e XIV secolo*, Mandragora, 2018; Bruzelius, Caroline. "Hearing is Believing Clarissan Architecture, ca. 1213-1340", *Gesta* 31/2 (1992): 83-91; Bruzelius, Caroline. "Nuns in Space: Strict Enclosure and the Architecture of the Clarisses in the Thirteenth Century" in Ingrid Peterson, ed., *Clare of Assisi: A Medieval and Modern Woman, Clarefest Selected Papers*, vol. III, Columbia University Press, 1996, 53-74.

<sup>4</sup> Andaloro, Maria. *La pittura medievale a Roma, Atlante percorsi visivi* 1, Jaca Book, 2006.

<sup>5</sup> Burdick, Anne, Johanna Drucker, Peter Lunenfeld, Todd Presner, and Jeffrey Schnapp. *Digital Humanities*. The MIT Press, 2012; Schreibman, Susan, Ray Siemens, and John Unsworth. *A Companion to Digital Humanities*, Blackwell Publishing, 2004; <https://www.oculus.com>; <https://vr.google.com/cardboard/>.

<sup>6</sup> For example:

<https://www.cam.ac.uk/research/news/virtual-reality-journey-through-a-tumour-cambridge-scientists-receive-ps40-million-funding-boost>.

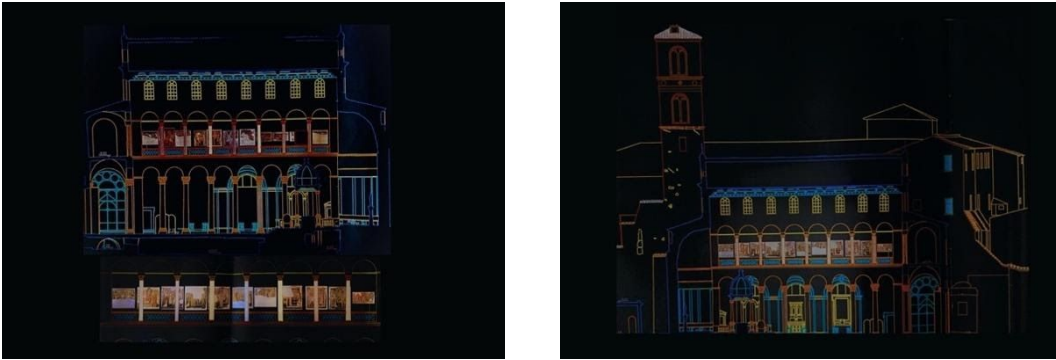


Figure 1. Axonometric View of Sant'Agnese fuori le mura with virtual restoration of detached fresco cycle.

**PETRARCH'S ITINERA.** Petrarch's influence durably shaped European literary and cultural consciousness. His figure is one of crucial importance in a number of fields – literary, intellectual, ethical and philosophical, political and diplomatic – where the transformation of medieval thought into the intellectual mindset of the Renaissance is noticeable. Petrarch's correspondence in particular preserves overwhelming evidence of his engagement with the contemporary world, by encompassing a wide range of recipients including prominent figures from the literary and the political establishment, as well as individuals of intellectual, ecclesiastical, juridical and diplomatic distinction.<sup>7</sup> Petrarch's Latin letters are identified as the project's primary object of investigation as they provide a matchless overview of fourteenth-century European culture and society – from England to Germany, from Sicily to Provence and Bohemia. The texts will be systematically card-indexed by means of a standard form, which will enable users to cross-check the collected data in the most flexible and extensive way. In particular, Roma Tre unit, coordinated by Luca Marcozzi, will achieve a card-indexing of Petrarch's correspondents, and participate to the setting up of the database and to the output of results and their interrogation. This activity has been guided so far by prof. Paul Weston (Pavia University), who is working in cooperation with the Siena Unit, directed by Natascia Tonelli. Students and junior researchers from Roma Tre will record and analyze data in the framework of the DH Lab.<sup>8</sup>

The materials will be made available in an open-access database, designed according to criteria of scalability, portability and interoperability and suitable for rapid and intuitive consultation. This last point has special importance, insofar as the materials stored on digital platforms are making a decisive contribution to the study of Italian and Latin medieval literature and more generally to the advancement of historical-philological disciplines. The database and its biographical entries constitute the project's core business, with its multiple search options, its cross-referencing pathways and interactive maps developed along the principles of literary cartography. The database will also include data on the poems of correspondence and its protagonists, the texts themselves and the information on their manuscript and printed tradition, accompanied with HD reproductions of the most important manuscripts (a task of the Napoli and Perugia units, coordinated by Marco Cursi and Daniele Piccini), all interconnected by a system of hypertextual links and cross-references. The ultimate objective is the production of an atlas detailing the circulation of humanistic knowledge, ideas, genres and literary forms in the transition from the Middle Ages to the Renaissance.

**LILEO DIGITAL ATLAS.** *LiLeo Digital Atlas: Leonardo Word-and-Image Editions* focuses on Leonardo da Vinci's writings and drawings, and investigates their relationship with scientific studies, in order to make sense of the artist's aims and combinatory devices.<sup>9</sup> By designing a diagrammatic model that enables the juxtaposition and layering of drafts belonging to similar projects in Leonardo's works and sources, *LiLeo Digital Atlas* tracks the evolution of forms through different media and underlines recurrent patterns in his output. The identified diagrams are digitized as part of the Omeka

<sup>7</sup> Marcozzi, Luca, and Francisco Rico. *Petrarca, Francesco*, in *Dizionario biografico degli Italiani*, vol. 82, Istituto della Enciclopedia Italiana, 2015, 671-84.

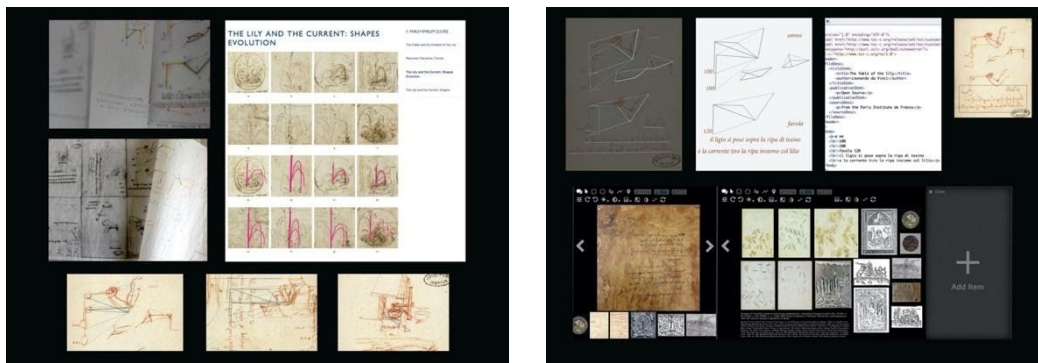
<sup>8</sup> Recent significant digital projects on Petrarch are *Petrarchive: An Edition of Petrarch's Songbook "Rerum Vulgarium Fragmenta"* (<http://dcl.slis.indiana.edu/petrarchive/>), and *RDP. Le "rime disperse" di Petrarca: l'altra faccia del Canzoniere* (<https://www.unige.ch/petrarca/it/homepage/>).

<sup>9</sup> Barkan, Leonard. *Michelangelo: A Life on Paper*, Princeton University Press, 2011, 2-14; Zwijnenberg, Robert. *The Writings and Drawings of Leonardo da Vinci: Order and Chaos in Early Modern Thought*, Cambridge University Press, 1999; Cimigliaro, Giuditta, and Carlo Vecce. *Leonardo da Vinci: Favole e profezie. Scritti letterari*, Garzanti, 2019.



digital archive *Lileo* (<https://blogs.libraries.rutgers.edu/lileo/>)<sup>10</sup>, which is the basis for the creation of the hyper-medial edition *LiLeo Digital Atlas*, developed at Roma Tre University, in collaboration with the Galileo Museum of Florence.<sup>11</sup>

As part of the *LiLeo Digital Atlas* project, subjects that feature both in Leonardo's codices and in his textual and visual sources are catalogued and grouped according to their typology, format, and field of investigation. The goal of the project is to digitally enable the juxtaposition and layering of drafts belonging to similar projects in Leonardo's works and sources, in order to identify aesthetic and scientific patterns in his output, uncover the origins of his interdisciplinary research, and reveal his creation of a hieroglyphic language.<sup>12</sup> *LiLeo Digital Atlas* will show digital editions on the work of Leonardo, his sources (Aesop, Pliny, etc.) and the work of his contemporaries (Giuliano da Sangallo, Francesco di Giorgio), which feature related visual and textual structures (Figure 2). By combining new approaches in the digital humanities with traditional artistic tools, *LiLeo Digital Atlas* expands the work of the already existing digital archives on Leonardo's codices; it provides original insights for early modern research on intertextual languages, and makes original sources of early modern culture available to a wider public. *LiLeo Digital Atlas* is an interoperable, durable and scalable digital product – which not only explores Leonardo's transdisciplinary modes of investigation, but it also opens to multiple uses across different forms, media, and fields of study.



**Figure 3, 4. LiLeo Digital Atlas diagrammatic tables and digital tools ‘Visualize>word/image’ and ‘Connect>Leonardo/sources’**

<sup>10</sup> Ciriagliaro, Giuditta. “The Digital Reconstruction of Leonardo’s Library: Revealing Formal Patterns in Early Modern Thought.” In *Special Issue on “Digital Humanities for Academic and Curatorial Practice”*, *Studies in Digital Heritage* 3, 2 (2019): 128-143.

<sup>11</sup> Exemplary work with the aim to broaden access to Leonardo’s codices is represented by *e-Leo Digital Archive of History of Technology and Science* (<https://www.leonardodigitale.com>), and “*La Biblioteca di Leonardo*” (<https://bibliotecadileonardo.museogalileo.it/>).

<sup>12</sup> Cf. Vecce, Carlo. “Parola e immagine nei manoscritti di Leonardo da Vinci.” In *Percorsi tra parole e immagini (1400-1600)*, edited by Angela Guidotti, and Massimiliano Rossi, Maria Pacini Fazzi, 2000, 19-35; Cursi, Marco, “Leonardo da Vinci: Books.” In *Collecting, Organizing, and Transmitting Knowledge. Miscellanies in Late Medieval Europe*, edited by Sabrina Corbellini, Giovanna Murano, and Giacomo Signore, Brepols, 2018, 233-248.