

Embodying Scholarly Annotations in the Network of Digitized Archives

Tsz-Kin Chau; eM+, Swiss Federal Technology Institute of Lausanne (EPFL); 1025 Saint-Sulpice, Vaud/Switzerland
Sarah Kenderdine; eM+, Swiss Federal Technology Institute of Lausanne (EPFL); 1025 Saint-Sulpice, Vaud/Switzerland

Abstract

The increasing availability of digitized archives presents new opportunities for scholarly research, yet effective reuse of these resources requires infrastructure that is interoperable with open data. This paper presents a novel annotation platform for the scholarly research on visual material, based on a customization of the ResearchSpace platform. By directly integrating images served via the IIIF Image API (v2/v3), the system ensures a high level of digital provenance and source reliability, crucial for research in history-oriented humanities.

The paper outlines the platform's technological framework, highlighting how its architecture fosters deep scholarly engagement with digitized materials and exploring the potential applications of annotation outcomes. Additionally, it discusses the challenge of streamlining the connection between researchers and digitized archives. Future improvements will focus on automating metadata integration and tackling interoperability challenges across diverse data models.

Context and Research Objective

The increasing availability of dereferenceable resources (e.g., IIIF, CTS, DTS) from digitized archives presents new opportunities for scholarly research. For historically oriented humanities, where scholarly arguments rely on accessible primary sources, digital archives provide a crucial foundation. Provenance has always been a key concern in historical research, and while open access digitized archives ensure reliability at the source level, existing scholarly workflows struggle to integrate and reference digitized sources effectively. While digital publishing platforms like the Journal of Digital History [1] introduce the “Hermeneutics” layer, demonstrate how scholars can dynamically present and transform sources directly from digital repositories, marking a paradigm shift in how digital archives support scholarly argumentation.

This paper introduces our ongoing development of a linked data scholarly annotation platform designed to integrate vast online resources from digitized archives into art-historical research. Our platform facilitates an end-to-end workflow for incorporating content shared through the IIIF Presentation API (v2/v3) into scholarly activities such as source collection, visual observation, comparison, and dataset publication. It was developed as part of a digital scholarly edition of *The Panorama of the Battle of Murten* (1894) by Louis Braun (1836–1916), which was digitized in 2023 at 1,000 dpi and fully processed in June 2024 by eM+, EPFL [2].

Source-centric Scholarly Annotation Methodology

While historical research is characterized as “the procedure of explaining an event by tracing its intrinsic relations to other events” [3], we conceptualize art-historical research as “to trace the intrinsic relations of an image to the situated network of visual origins”. In

the contemporary digital research environment, this process relies on the integration of multiple domain-specific systems. A scholarly statement relies on the flow of information from upstream digital resources, including digital archives, that provide digital representations and metadata, and linked vocabulary resources.

Digital provenance and collaborative scholarship

Digital provenance is best ensured through a seamless data chain from archival sources to scholarly publication. The collecting institution tracks the primary provenance and publishes metadata for a cultural heritage object, followed by a mass digitization project that creates its digital representation. An interoperable framework ideally facilitates the flow of metadata and digital representations into the research environment, providing researchers with trusted resources for analysis. Within this environment, researchers generate scientific artifacts, such as annotations or code-generated charts, which can then be submitted to peer-reviewed digital publishing venues. This process avoids generating derivative representations by using code to describe transformations applied to the original resource. Such an approach ensures that metadata and digital representations from the collecting institution are fully integrated into the research lifecycle, minimizing destructive derivatives, as highlighted in the Yellow Milkmaid Syndrome [4].

In a source-centric scholarly annotation methodology, linked vocabulary resources, such as Pleiades, ICONCLASS, VIAF, and Wikidata, play a critical complementary role. These rigorously curated and citation-backed authorities offer essential contextual information. Grounding annotations in these structured vocabularies enhances the reliability and traceability of scholarly interpretations derived from primary sources. A common annotation practice involves linking a vocabulary resource as an external resource in the Web Annotation Data Model to a specific area of interest (e.g., an image or text fragment) using `oa:hasBody` and `oa:hasTarget` respectively. (See Fig. 1)

Annotation in digital humanities

In digital humanities, annotation serves multiple roles, from scholarly primitives [5] to publishable scholarly contributions, such as editions and gloss. The former, often lightweight, portable, and efficient, typically employs simpler data models or semantic shortcuts to facilitate labelling. It often functions as an intermediate layer in the research process, for example, distant viewing projects and machine learning datasets creation. The latter positions annotations as first-class scholarly entities, emphasizing systematic commentary and custom data models to capture domain-specific knowledge patterns, document scholarly assumptions, interpretative criteria, and sources.

Scholarly annotation can be categorized as what Clifford Geertz called “thick description”, as put by Oldman et al [6], in which such information offers a richer, layered interpretative

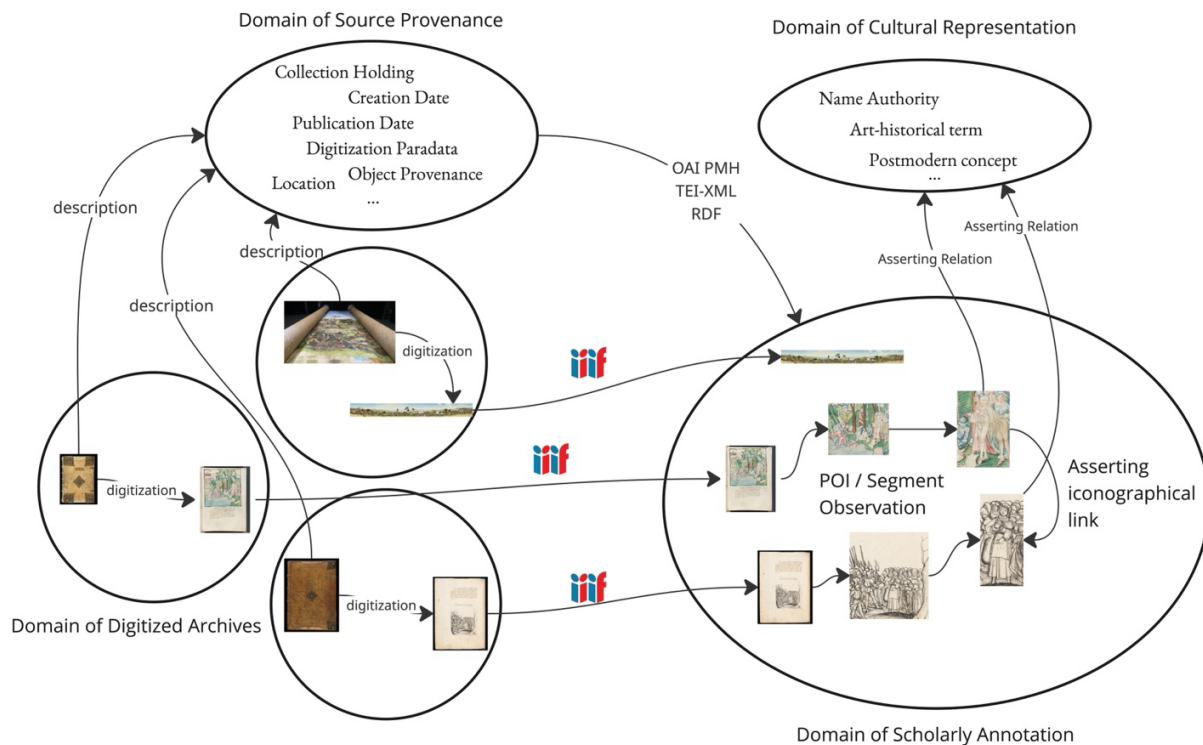


Figure 1. Conceptual diagram of the Source-centric Scholarly Annotation Methodology in a digital research environment (figure created by author)

approach with context, situated at the boundary between structural and anti-structural information.

Requirements for a digital scholarly annotation system

To support the latter form of annotation outlined above, we identified the following key requirements for a digital scholarly annotation system:

- R1. Direct incorporation of dereferenceable resources:** Annotations must be linked to digital archival materials, supporting encoding full-object level or segment level (Point of Interest, POI) annotations as interoperable linked data.
- R2. Support for historical research workflows:** The system must accommodate research patterns such as source collection, collation, comparison, and scholarly interpretation across sources.
- R3. Interoperability and reusability:** Research outputs should be available as linked data, supporting reuse in federated queries or integration with other applications.
- R4. Flexible ontology management:** Scholars make different forms of annotations at varying depths. Being able to import additional ontology and customize data model enhances the flexibility and expressiveness of digital scholarly annotation systems.

Related Work

Existing open-source annotation libraries such as Mirador-Annotations [7], a Mirador 3 plugin, and Annotorious [8] allow semantic annotations on IIIF resources but do not facilitate source collection and description. With custom development, Mirador

Annotations can support diverse domain annotation data models (e.g. conservation studies, text interpretation) [9], [10].

Other platforms, such as HyperImage [11] and Tropy [12], incorporate IIIF resources and offer source collection features but lack web-based interoperability. Geovistory [13], a collaborative research and data publication environment, provides ontology extension management but primarily supports text-based materials.

Our Approach

We evaluated multiple approaches for implementing a linked data scholarly annotation system. While modular open-source stacks offer flexibility [14], they require extensive integration work. Alternatively, we chose developing from a single open-source Knowledge Graph Management Platform (KGMP) [15] to lower development and deployment overhead.

Among KGMPs, we identified ResearchSpace [16] as particularly well-suited because it uniquely supports:

- A built-in CIDOC-CRM framework for describing cultural fact (objects, events, actors etc.)
- Forms that enable the functionality of a Digital Asset Management System (DAMS) and Collections Management System (CMS)
- An IIIF image server based on digilib [17] paired with a Mirador 2 viewer with Mirador Annotation
- An integration of a triplestore and SPARQL endpoint for federated query
- A template-driven application development framework based on ReactJS
- An ontology management and data model customization tool

The ResearchSpace annotation tool is built on Mirador Annotations, where Web Annotation data is transformed into CIDOC-CRM and CRMdig-based RDF triples via a ReactJS component. It also includes a reverse mapping to Web Annotation to support the rendering of annotations within the Mirador viewer. This bidirectional mapping facilitates interoperability between CIDOC-CRM and IIIF resources, despite CIDOC-CRM not being officially implemented in JSON-LD.

Our platform development involves both data modeling and software engineering. The data modeling follows a middle-out approach [18], combining ground-source-driven (bottom-up) and literature-based (top-down) methods. The resulting model is expressed in CIDOC-CRM and its extensions to ensure familiarity for humanities researchers and museum curators. The software engineering process follows an iterative development model, incorporating feedback from domain experts through workshops.

Implemented Features of the Scholarly Platform

1. **IIIF Image Service Importer:** ResearchSpace features a local image library with IIIF image API support through digilib, but it lacks native integration for external IIIF resources. To address this, we utilize the REST Sail abstraction service to parse IIIF manifests, enabling users to select a target image from a multi-canvas manifest. (See Fig. 2) The selected image is instantiated as an `rso:EX_Digital_Image` object (conforming to `crm:E36_Visual_Item` and `crmdig:D1_Digital_Object`) and serves as the subject for subsequent scholarly statement assertions (see Table *Incorporating IIIF resources in CIDOC-CRM RDF*).

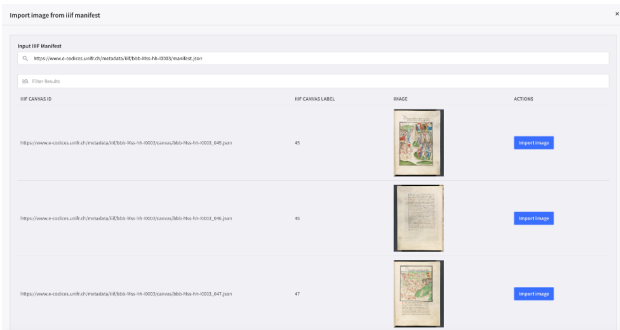


Figure 2. Screenshot of the IIIF Image Importer

2. **Source Collection and Description:** To support historical source provenance, we adopt the WEMI levels from LRMoo [19], allowing detailed provenance description, distinguishing of source content, carrier and exemplar provenance. For each externally imported IIIF resources, user can link the physical carrier (`crm:E18_Physical_Thing`, `lrmo:F5_Item`) and the digital image with the property `crmdig:L1_digitized`.
3. **SAM2 Integration:** To support researcher in creating fine-grained annotation mask on the desired POI, we integrate Segment Anything 2 (SAM2) [20] into the ResearchSpace Mirador instance. Our SAM2 is implemented as a server-side service running on CPU, ensuring accessibility for users with limited hardware resources.
4. **Hierarchical Segment Observation:** Segment observation is essential in art historical research methodology such as iconography [21], [22] and picture criticism [23]. Analyzing

how feature components or icon attributes evolve over time and across contexts is essential for describing diachronic and diatopic variations. Our platform enables users to assign `crm:P106_is_composed_of` to individual feature segments, allowing the resulting knowledge graph to be queried and visualized. (See Fig. 3)

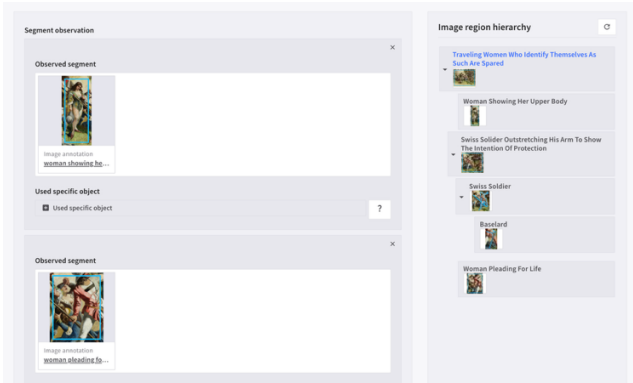


Figure 3. Screenshot of Hierarchical Segment Observation

5. **Scholarly Assertion Pattern:** The structure of scholarly assertions encompasses multiple possible facts, source support, and a source interpretation criterion [24], [25], [26]. Our implementation models scholarly assertions as `crm:E13_attribute_assignment` and `crminf:I1_argumentation`. Each assertion is explicitly recorded as a statement attributed to a specific user, who can provide scholarly justification. (See Fig. 4) The contribution will be minted as a PURL (`w3id.org`) to ensure its persistence as a citable resource, with the possibility to assign a Handle or DOI for enhanced resolvability. Over time, the annotation platform accumulates diverse and potentially contrasting statements from different users, enabling a dynamic and multi-perspective scholarly discourse.

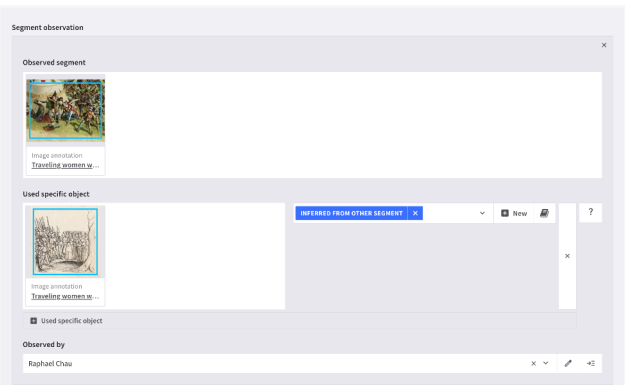


Figure 4. Screenshot of Segment Observation as scholarly assertion. A user can provide a source to support a particular segment observation

Feature Comparison Among Annotation Platforms

	Our ResearchSpace Customization	Recogito / Mirador-Annotation / Annotorious
Data Model	CIDOC-CRM + Extensions	WADM
Serialization	RDF	JSON-LD
Main annotation purpose	Scholarly edition, knowledge graph creation	Part of research pipeline, general purpose
Built-in CSM/DAMS	Y	N
Built-in annotation store	Y (Blazegraph)	Custom implementation / cloud-based annotation store
Built-in structural data viewer	Y (See Fig. 6)	N
Fully dereferenceable	Y	N
Low-code customization	Y (Handlebars template)	N
Scholarly methodology	Hierarchical segment observation, scholarly assertion	Not specified, depends on customization

Embodying Scholarly Annotations in the Network of Digitized Archives

See Fig. 5 demonstrates that our platform enables scholars to analyze variations in historical visual narratives situated in the network of sources from digitized archives. For instance, the plot feature of a group of women spared by Swiss soldiers in the Battle of Murten panorama differs across 15th (Mss.h.h.I.3, Burgerbibliothek Bern), 16th (ZF 18, Aargauer Kantonsbibliothek), and 19th century (Murten Panorama) exemplars, reflecting an evolving cultural background. The POIs are displayed directly using the IIIF Image API on e-codices [27] and our custom IIPImage implementation, which serves the 1.6-terapixel (3,805,340 x 425,000) digital twin.

Demonstrator

Our annotation platform is being developed for the linked data digital scholarly edition of the Panorama of the Battle of Murten, which will involve contributions from museum curators, historians, and digital humanists. Physically measuring 10 x 100 meters

approximately, the 1.6-terapixel digital twin is a rich and intricate image encompassing a wide range of content including plots, real-world places, people, heraldic representations, objects, costumes with their iconographies traceable to museum collections, illustrated chronicles, and historical documents.

The edition will integrate sources from across digitized archives, including but not limited to e-codices, the Bavarian State Library [28], and e-rara [29]. Scheduled for launch in June 2025, it will provide multiple data access formats, including a knowledge base portal, a storytelling interface, and a SPARQL endpoint.

Limitation and discussion

1. **IIIF manifest versioning:** Fundamentally, the IIIF Image Service URI is not considered a persistent URI. To mitigate potential issues caused by URI changes, the platform also stores the persistent parts —Manifest and Canvas URIs. However, there is currently no mechanism in place to detect or handle any changes to these URIs.
2. **Scholarly contribution versioning:** The current ResearchSpace build supports tracking change events but does not preserve historical content states. Alternatively, following CIDOC-CRM's open-world assumption, it is possible to implement a non-deletable system where each update is treated as the addition of a new scholarly assertion.
3. **Problem of metadata flow:** As outlined in our source-centric scholarly annotation methodology, the ideal information flow between digitized archives and the research environment should be machine-driven. However, this remains an open challenge due to the diverse data models employed by different archives, unlike the IIIF Image Service, a unified importer is difficult to develop and maintain.
4. **Issue with ResearchSpace:** While building on ResearchSpace allows rapid prototyping, its monolithic structure presents challenges. For example, Blazegraph's quad-mode limitations prevent enabling its reasoner. Attempts to replace Blazegraph with Apache Jena [30] were unsuccessful due to SPARQL compliance differences.

Conclusion

Our linked data scholarly annotation platform enhances the integration of digitized archival resources with art-historical research. By building upon ResearchSpace and leveraging IIIF Image API, CIDOC-CRM, and SAM2, we provide scholars with an interoperable environment for source collection, visual analysis, and structured scholarly assertions. Future work will focus on automating metadata integration and addressing infrastructure limitations.

Incorporating IIIF resources in CIDOC-CRM RDF

```
<https://w3id.org/murtenpanorama/resource/image/e7c3d3c0-9ee2-4e8d-8c2a-2ffc7833a51c>
  a rso:EX_Digital_Image;
  crm:P138_represents
<https://w3id.org/murtenpanorama/resource/visual_source/3a5fe7c5-c2b9-4654-bc1a-6be0978e9867>;
  crm:P129i_is_subject_of
<https://w3id.org/murtenpanorama/resource/image/e7c3d3c0-9ee2-4e8d-8c2a-2ffc7833a51c/iiif_image>;
```

```

crmdig:L60i_is_documented_by
<https://w3id.org/murtenpanorama/resource/image/e7c3d
3c0-9ee2-4e8d-8c2a-2ffc7833a51c/digitization_process>;

<https://w3id.org/murtenpanorama/resource/image/e7c3d
3c0-9ee2-4e8d-8c2a-2ffc7833a51c/iiif_image>
a crmdig:D1_Digital_Object;
crm:P2_has_type <http://iiif.io/api/image>;
crm:P129i_is_subject_of <https://www.e-
codices.unifr.ch/loris/bbb/bbb-Mss-hh-I0003/bbb-Mss-hh-
I0003_767.jp2>;
crm:P165i_is_incorporated_in <https://www.e-
codices.unifr.ch/metadata/iiif/bbb-Mss-hh-
I0003/manifest.json>,
<https://www.e-codices.unifr.ch/metadata/iiif/bbb-Mss-
hh-I0003/canvas/bbb-Mss-hh-I0003_767.json> .

<https://www.e-codices.unifr.ch/metadata/iiif/bbb-Mss-hh-
I0003/canvas/bbb-Mss-hh-I0003_767.json> a
crmdig:D1_Digital_Object;
crm:P2_has_type <http://iiif.io/api/presentation#Canvas>
.

<https://www.e-codices.unifr.ch/metadata/iiif/bbb-Mss-hh-
I0003/manifest.json> a crmdig:D1_Digital_Object;
crm:P2_has_type
<http://iiif.io/api/presentation#Manifest> .

<https://w3id.org/murtenpanorama/resource/image/e7c3d
3c0-9ee2-4e8d-8c2a-2ffc7833a51c/digitization_process>
a crmdig:D2_Digitization_Process;
crmdig:L1_digitized
<https://w3id.org/murtenpanorama/resource/item/a8f2ed3
8-902d-4c8f-8bc0-6c8735ef88e7> .

```

References

- [1] A. Fickers and F. Clavert, "On pyramids, prisms, and scalable reading," *JDH*, no. jdh001, Oct. 2021, Accessed: Feb. 28, 2025. [Online]. Available: <https://journalofdigitalhistory.org/en/article/jXupS3QAeNgb>
- [2] D. Jaquet and S. Kenderdine, "The Digital Twin of the Panorama of the Battle of Murten: Notes on the Creation of the World's Largest Image," in *Panoramic and Immersive Media Studies Yearbook*, M. C. Briggs, T. Logge, and N. C. Lowe, Eds., De Gruyter, 2024, pp. 295–306. doi: 10.1515/9783111335575-022.
- [3] Walsh W. H., *An Introduction To Philosophy Of History*. Hutchinson's University Library., 1951. Accessed: Sep. 30, 2024. [Online]. Available: <http://archive.org/details/dli.ernet.503059>
- [4] S. Stierch, "Yellow Milkmaid Syndrome." Accessed: May 15, 2025. [Online]. Available: <https://yellowmilkmaidsyndrome.tumblr.com/>
- [5] J. Unsworth, "Scholarly primitives: What methods do humanities researchers have in common, and how might our tools reflect this," in *Symposium on Humanities Computing: Formal Methods, Experimental Practice*. King's College, London, 2000, pp. 5–00. [Online]. Available: <https://people.brandeis.edu/~unsworth/Kings.5-00/primitives.html>
- [6] D. Oldman, D. Tanase, and S. Santschi, "The problem of distance in digital art history," *International Journal for Digital Art History*, p. 5.29-5.45 Pages, Dec. 2019, doi: 10.11588/DAH.2019.4.72071.
- [7] ProjectMirador, *mirador-annotations*. (2015). JavaScript. ProjectMirador. Accessed: Nov. 16, 2023. [Online]. Available: <https://github.com/ProjectMirador/mirador-annotations>
- [8] S. Rainer, *annotorious-openseadragon*. (2013). Accessed: Dec. 26, 2023. [Online]. Available: <https://github.com/annotorious/annotorious-openseadragon>
- [9] F. G. France and A. Forsberg, "Linked Open and Annotated Science and Heritage Data," *archiving*, vol. 16, no. 1, pp. 151–155, May 2019, doi: 10.2352/issn.2168-3204.2019.1.0.35.
- [10] J. Wolff, A. Probst, and E. Bodenschatz, "Bringing researchers together with IIIF," *Art Libraries Journal*, vol. 49, no. 1, pp. 37–43, Jan. 2024, doi: 10.1017/alj.2023.33.
- [11] J.-M. Loebel and H.-G. Kuper, "HyperImage: Of Layers, Labels and Links.," presented at the RENEW 2013 – 5th International Conference on the Histories of Media Art, Science and Technology, Riga, Latvia, Oct. 2013.
- [12] S. M. Robertson and A. Mullen, "Tropy: A Tool for Research Photo Management," presented at the DH2017, 2017.
- [13] V. Alamercury *et al.*, "Open Research Practices with the OntoME-Geovistory environment," presented at the Digital Humanities 2023. Collaboration as Opportunity (DH2023), Jul. 2023. doi: 10.5281/zenodo.8107384.
- [14] S. Bin, C. Stadler, N. Radtke, K. Junghanns, S. Gründer-Fahrer, and M. Martin, "Base Platform for Knowledge Graphs with Free Software," in *Proceedings of the Second International Workshop on Linked Data-driven Resilience Research 2023 co-located with Extended Semantic Web Conference 2023 (ESWC 2023)*, Hersionissos, Greece, May 28, 2023, May 2023.
- [15] R. Nasarek and L. Rossenova, "Linked Open Data Management Services: A Comparison." Zenodo, Mar. 15, 2023. doi: 10.5281/zenodo.7738424.
- [16] D. Oldman and D. Tanase, "Reshaping the Knowledge Graph by Connecting Researchers, Data and Practices in ResearchSpace," in *The Semantic Web – ISWC 2018*, vol. 11137, D. Vrandečić, K. Bontcheva, M. C. Suárez-Figueroa, V. Presutti, I. Celino, M. Sabou, L.-A. Kaffee, and E. Simperl, Eds., in Lecture Notes in Computer Science, vol. 11137. Cham: Springer International Publishing, 2018, pp. 325–340. doi: 10.1007/978-3-030-00668-6_20.
- [17] "digilib - The Digital Image Library –." Accessed: May 14, 2025. [Online]. Available: <https://robcast.github.io/digilib/>
- [18] M. E. Ghosh, H. Naja, H. Abdulrab, and M. Khalil, "Towards a Middle-out Approach for Building Legal Domain Reference Ontology," *IJKE*, vol. 2, no. 3, pp. 109–114, 2016, doi: 10.18178/ijke.2016.2.3.063.
- [19] C. Bekiari, M. Doerr, P. le Boeuf, and P. Riva, "LRMOO object-oriented definition and mapping from the IFLA Library Reference Model." Apr. 2024.
- [20] N. Ravi *et al.*, "SAM 2: Segment Anything in Images and Videos".
- [21] N. Carboni and L. de Luca, "An Ontological Approach to the Description of Visual and Iconographical Representations,"

Heritage, vol. 2, no. 2, Art. no. 2, Jun. 2019, doi: 10.3390/heritage2020078.

- [22] S. Baroncini, M. Daquino, and F. Tomasi, “Modelling Art Interpretation and Meaning. A Data Model for Describing Iconology and Iconography,” Jun. 23, 2021, *arXiv*: arXiv:2106.12967. Accessed: Jan. 14, 2024. [Online]. Available: <http://arxiv.org/abs/2106.12967>
- [23] T. Gengnagel, *Digital Scholarly Editions Beyond Text*. arthistoricum.net, 2024. doi: 10.11588/ARTHISTORICUM.1132.
- [24] M. Daquino and F. Tomasi, “Historical Context Ontology (HiCO): A Conceptual Model for Describing Context Information of Cultural Heritage Objects,” Sep. 2015. doi: 10.1007/978-3-319-24129-6_37.
- [25] G. Barabucci, F. Tomasi, and F. Vitali, “Supporting Complexity and Conjectures in Cultural Heritage Descriptions,” 104-115, 2021, Accessed: Feb. 28, 2025. [Online]. Available: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2736994>
- [26] E. M. Sanfilippo, A. Sotgiu, G. Tomazzoli, C. Masolo, D. Porello, and R. Ferrario, “Ontological Modeling of Scholarly Statements: A Case Study in Literary Criticism,” in *Frontiers in Artificial Intelligence and Applications*, N. Aussenac-Gilles, T. Hahmann, A. Galton, and M. M. Hedblom, Eds., IOS Press, 2023. doi: 10.3233/FAIA231139.

- [27] “e-codices – Virtual Manuscript Library of Switzerland.” Accessed: May 14, 2025. [Online]. Available: <https://www.e-codices.unifr.ch/en>
- [28] “Bayerische Staatsbibliothek.” Accessed: May 14, 2025. [Online]. Available: <https://www.bsb-muenchen.de/>
- [29] “e-rara.” Accessed: May 14, 2025. [Online]. Available: <https://www.e-rara.ch/>
- [30] Apache Software Foundation, *Apache Jena*. (2021). [Online]. Available: <https://jena.apache.org/>

Author Biography

Tsz-Kin (Raphael) Chau is a PhD candidate in Digital Humanities at the Swiss Federal Technology Institute of Lausanne, Switzerland, with a background in history, art history, digital humanities, and artificial intelligence. He is interested in the curation, retrieval, dissemination, and experience of big cultural data on the web. Currently, he is working on the Terapixel Panorama project, a collaboration between EPFL and the Foundation for the Panorama of the Battle of Murten.

*Sarah Kenderdine’s research is at the forefront of interactive and immersive experiences for galleries, libraries, archives and museums. She is a professor at EPFL, Switzerland, where she leads the Laboratory for Experimental Museology (eM+). She is a former director of EPFL Pavilions (2017— 2024) and has now taken on the role of curator-at-large. She has an upcoming book, titled *Deep Fakes: A Critical Lexicon of Digital Museology*, published by Routledge (2025).*

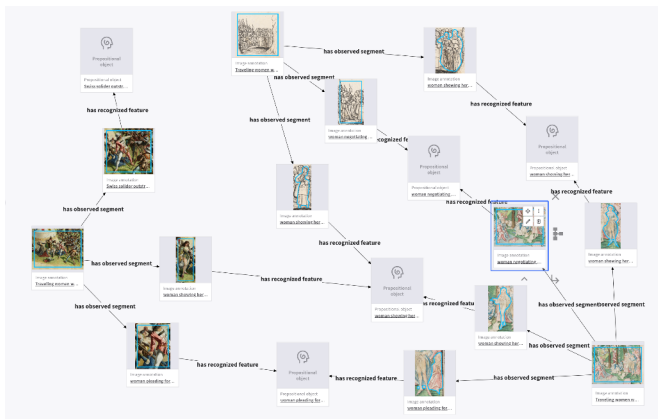


Figure 5. Screenshot of using the ResearchSpace Knowledge Map feature for diachronic analysis of the plot “a group of women spared by Swiss soldiers in the Battle of Murten”. On the top left, a unique novel subplot is identifiable. On the right, subplots shared by 15 and 16th century exemplars are missing in the 19th century

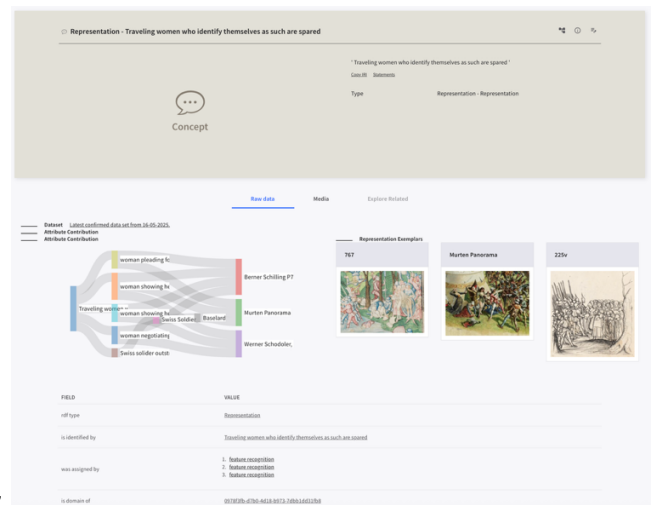


Figure 6. Screenshot of our customized ResearchSpace data viewer, showcasing a recurring plot concept from See Fig. 5. The viewer provides a raw data view for any URI minted on the system. Our customization enables users to quickly explore all exemplars of this plot concept within the system, alongside the contribution pattern of subplots and attributes to each exemplar