CAA 2026

CALL FOR PAPERS

https://2026.caaconference.org/

Computer Applications &
Quantitative Methods in Archaeology

You are invited to submit an abstract for a paper or poster on any aspect of computer applications or quantitative methods in archaeology for presentation at CAA's 53rd conference to be held in Vienna, Austria.

Deadlines: 15 September - 26 October 2025

Each session will follow one of the following formats:

Standard – with a series of formal papers (normally 10-20 minutes in length + time for questions) addressing a theme presented in advance by the organisers.

Round Table – with a pre-conference position paper published by the organisers, followed by an invitation for researchers to submit a response in advance or to participate in open-forum discussion at the session. Please see the round table page for the abstracts and additional information.

Other – with the format decided by the organisers, exploring innovative and creative ways for participants to engage with the session.

Please check the format of each session carefully before submitting an abstract and see the guidelines below to learn more about the different requirements for each type.

If your presentation is applicable to more than one session, please indicate that during the submission process by selecting the one that best matches the topic of your paper as your primary subject area and up to four other related sessions as secondary options. If none of the sessions are appropriate for your paper, please mark the closest fit as your primary choice and then the "Advances in Computational Archaeology" as a secondary option.

Abstracts for posters should only be submitted to the *poster session*. Authors will be invited to make an optional short presentation about their poster during the session.

Please note that CAA conferences are running a double-blind review process, therefore authors' affiliation and/or any information within the text that may indicate who the author(s) should be omitted from the submission.

Submitting an Abstract

To **submit your abstract** please go to Conference Management Toolkit cv (CMT)* (You will need to create an account if you have not previously submitted a proposal in CMT). Please review and follow the guidelines for authors**.**

CAA 2026_CFP_guidelines

*Individuals may only be the first named author on **one** standard paper or other format session requiring a full paper. Round tables, posters, lightning talks or similar short presentations are excluded from this limit.*

Abstracts should be broad enough to reach all interested researchers, regardless of affiliation or background. The official language of the conference is English, and all abstracts should be submitted in English. You will be required to endorse the CAA ethics statement as part of your submission.

The CAA2026 call for papers will stay open until **26 October 2025**. Any technical queries related to the CAA2026 submission system, questions about conference organisation or other logistical queries should be directed to caa2026@caaconference.org. Any queries related to the scientific or review process should be sent to the scientific committee at: scientificcommittee@caa-international.org.

CAA membership is not required to submit a proposal. However, *all conference attendees, including speakers, will need to be a 2026 member prior to registering*. 2026 memberships will be available starting around 1 November 2025. For additional information about CAA's fees and categories, please visit the Membership page.

Submissions from Student and Early Career Researchers

Papers and posters from Students and Early Career Researchers are actively encouraged.

The Nick Ryan Bursary will be awarded to the best student paper at CAA2026 and the recipient will receive a bursary of up to € 1,000 to travel to the CAA2027 conference.

Students who wish to be considered for the Nick Ryan Bursary should review the guidelines and then check yes to ***question 2*** when submitting their abstract to a standard/ other format session.

The CAA International Scientific Committee will shortlist the top student papers for participation in the Nick Ryan Bursary session during the abstract review process. Shortlisted authors will be asked to record and submit a video of their paper presentation approximately two weeks before the conference. During the conference, all Nick Ryan Bursary participants will present their papers in-person in the session for which they were accepted. The winner of the Nick Ryan Bursary award will be announced at the Annual General Meeting (AGM).

Session Formats

Standard Sessions

Extended abstracts (1,000 words maximum, plus up to 3 citations) will be required for papers submitted to standard sessions. The content of your abstract should be appropriate for the nature of the paper you intend to present.

For scientific papers, your abstract could include:

- Introduction – an overview of the background to your research and the research questions that will be addressed by your paper;
- Methods and materials – a summary of the sources of data used and the methods employed in your research;
- Results – a description of the results of your research;
- Discussion – a discussion of the wider implications of your research;
- References – up to 3 citations (cited using the Chicago Manual of Style 17th Edition Author Date format, see below).

For discursive or theoretical papers, your abstract could include:

- Context – an overview of the current state of the art and the problems that will be addressed by your paper;
- Main argument – a summary of the key points in your argument;
- Applications or implications – a discussion of the wider implications of your paper for computer applications and quantitative methods in archaeology;
- References – up to 3 citations (cited using the Chicago Manual of Style 17th Edition Author Date format, see below).

Abstracts should contain sufficient information to allow the CAA Scientific Committee to evaluate the scientific content of your paper. You may include a single figure (see below) that shows the key results or main argument of your paper.

Round Tables

Round table sessions offer a more interactive format, and organisers are expected to nominate participants by the deadline for the Call for Papers. Nominated panelists do not need to submit abstracts through CMT. If you are interested in being a speaker in one of the accepted round table sessions, please email the chair using the email address listed on the abstract to discuss your potential contributions.

Other

Extended abstracts (1,000 words maximum, plus 3 citations) will be required for papers submitted to other sessions. The content of your abstract should be appropriate for both the format of the other session and the nature of the paper you intend to present.

For scientific papers, your abstract could include:

- Introduction – an overview of the background to your research and the research questions that will be addressed by your paper;
- Methods and materials – a summary of the sources of data used and the methods employed in your research;
- Results – a description of the results of your research;
- Discussion – a discussion of the wider implications of your research;
- References – up to 3 citations (cited using the Chicago Manual of Style 17th Edition Author Date format, see below).

For discursive or theoretical papers, your abstract could include:

- Context – an overview of the current state of the art and the problems that will be addressed by your paper;
- Main argument – a summary of the key points in your argument;
- Applications or implications – a discussion of the wider implications of your paper for computer applications and quantitative methods in archaeology;
- References – up to 3 citations (cited using the Chicago Manual of Style 17th Edition Author Date format, see below).

Abstracts should contain sufficient information to allow the CAA Scientific Committee to evaluate the scientific content of your paper. You may include a single figure (see below) that shows the key results or main argument of your paper.

Lightning talks or similar contributions are excluded from the limit of one paper per first named author, i.e. a participant can submit an abstract for both a lightning talk and a 20-minute paper. Participants in other session formats will still have the opportunity to submit a paper for inclusion in the conference proceedings.

Posters

Abstracts (200-500 words, plus up to 3 citations) will be required for posters. Your abstract should include:

- Subject – a description of the methods used and key results (scientific posters), or main argument (discursive or theoretical posters);
- Background – a summary of the topic or research question addressed by the poster;
- Discussion – a discussion of the wider implications of your research for computer applications and quantitative methods in archaeology;
- References – up to 3 citations (cited using the Chicago Manual of Style 17th Edition Author Date format, see below).

Your abstract should contain sufficient information to allow the CAA Scientific Committee to evaluate the scientific content of your poster. You may include a single figure (see below) that shows the key results or main argument of your paper.

Accepted posters will be displayed during the conference, and authors will be invited to make an optional short presentation about their poster during the session.

Citations and Figures

Citations

Citations should use the Chicago Manual of Style 17th Edition Author Date style. It is recommended that you use a citation manager. Style files can be either installed directly from within your citation manager or downloaded from:

- Endnote;
- Mendeley;
- Zotero;

If you do not use a citation manager, please make sure you carefully follow the examples for the Chicago Manual of Style 17th Edition Author Date style from the Citation Quick Guide.

Figures

A single figure (optional) that shows the key results or main argument of your paper can be submitted with your abstract. Figures should be submitted in a format that can be displayed in a standard web browser and should have a minimum resolution of 300 DPI.

* "The Microsoft CMT service was used for managing the peer-reviewing process for this conference. This service was provided for free by Microsoft and they bore all expenses, including costs for Azure cloud services as well as for software development and support."

Session Descriptions

S1: Hic sunt dracones? Link ‘em all! Linked Open Data, Wikidata and CIDOC CRM in archaeology

Session Organisers:

Florian Thiery, Leibniz-Zentrum für Archäologie (LEIZA), Mainz, Germany & Research Squirrel Engineers Network

Martina Trognitz, Austrian Centre for Digital Humanities (ACDH), Austrian Academy of Sciences, Vienna, Austria

Stephen Stead, Paveprime Ltd, Purley, United Kingdom

Daria Stefan, TU Wien, Vienna, Austria

Session Format: Standard

Description

Today, the World Wide Web (WWW) enables researchers to share their data, allowing the wider community to participate in scientific discourse and generate new knowledge. However, much of this shared data is neither findable nor accessible, resulting in gaps in the web map. Historical maps used the phrase 'Hic sunt dracones' (Latin for 'Here be dragons') to denote areas unknown to the mapmaker. Similarly, our modern 'unknown data dragons' lack connections to other datasets — they are not interoperable and, in some cases, unusable. To overcome these shortcomings, Linked Open Data (LOD) (Berners-Lee, 2006; Hylandet et al., 2013) techniques, as part of the wider Semantic Web, and Linked Open Usable Data (LOUD) (Sanderson 2019), can be used.

LOD and LOUD represent a way to provide data that adheres to the FAIR principles (Wilkinson et al., 2016), which were introduced in 2016. The acronym stands for Findable, Accessible, Interoperable and Reusable research data and metadata. To allow for greater interoperability and compatibility of digital datasets, CIDOC CRM (2024) and its extensions have established themselves as a de facto standard for digital archaeology data. A last puzzle piece to help in finding and linking all the data dragons are Wikibase instances, such as Wikidata, which entered the world in 2012 (Vrandečić and Krötzsch, 2014).

Semantic Modelling and LOD are a core part of Computational Archaeology and also an essential part of the FAIRification and Research Data Management (RDM) process inside the Research Data Lifecycle (e.g., Thiery et al., 2023; Schmidt et al, 2022; Thiery et al., 2023b;

Thiery and Thiery, 2023; Panagiotopoulos and Trognitz, 2025). Interlinked LOD, plays a significant role in Open Science and gains more and more importance as a backbone for international and interdisciplinary RDM initiatives, such as the German National Research Data Infrastructure (NFDI), the European Collaborative Cloud for Cultural Heritage (ECCCH) or ARIADNEplus.

The Semantic Web offers a variety of vocabularies, ontologies and reference models that can be used for archaeology-related LOD modelling: CIDOC CRM, SKOS, PROV-O, FOAF, GeoSPARQL, Wikidata, etc. The Linked Data Cloud (McCrae et al, 2025) already provides FAIR and LOUD research data repositories, data hubs and domain-specific ontologies for specific archaeological and humanities domains such as Nomisma, Kerameikos, Pelagios, OpenContext, Portable Antiquities Scheme, ARIADNE, Linked Open Samian Ware, Linked Open ARS, Linked Open Ogham, and the Ceramic Typologies Ontology.

To enable non-experts to engage with FAIR and LOUD data, research tools – little minions – were created for different purposes, such as modelling relative chronologies in RDF, modelling and reasoning on vague edges in graph data, creating annotated texts and images, and SPARQL, as well as enhancing Geo-Datasets using, e.g., the SPARQLing Unicorn QGIS Plugin. In addition, community-driven knowledge bases like Wikidata not only offer data but also provide several tools for using and interacting with it.

Our session aims to bring together experts and colleagues interested in learning about FAIR and LOUD data-driven publishing and applications, as well as collecting research application scenarios to promote research domain-specific solutions for research data management. We would like to discuss application-oriented and data-driven investigations into improving technologies for FAIR and LOUD data models as a basis for reproducible and CAREful research and exchange on the Semantic Web, as well as solutions related to one or more of the issues listed below:

- application of Semantic Web technologies, such as ontologies (e.g. CIDOC CRM) or RDF/RDF-star, to the archaeological domain
- modelling of archaeological artefacts, the archaeological context, including the specificity of stratigraphy, uncertainty, and vagueness
- development of research tools producing or using FAIR and LOUD data
- interlink other data modelling concepts to semantic techniques, e.g. LPGs, HINs, FAIR Digital Objects
- computer vision or machine learning applications built upon semantic data
- building up Knowledge Graphs by applying semantic and Artificial Intelligence (AI) technologies
- modelling comprehensible/reproducible workflows and data flows using RDF/RDF-star for documentation and reproducible research
- use of LOD tools in archaeological research, their implementation and/or enhancement
- possibilities, challenges, benefits and risks of the Wikimedia Universe (e.g. Wikidata, Wikibase instances, Wikimedia Commons) in archaeological research
- implementation of reference models such as CIDOC CRM in real-world datasets and ways to achieve LOD
- graphs of facts, beliefs, and/or assertions as a digital archaeological method

- reasoning with heterogeneous and real-world archaeological data in graphs
- graph and RDF/RDF-star representation of specific networks of persons, objects and information relating to research questions
- LOUD techniques as a solution for information and data annotation on objects/artefacts in 2D and 3D (e.g. cuneiform tablets, ogham stones, samian ware, books, texts, …)
- implementation of GeoSPARQL as a geospatial standard in archaeological data
- overcoming linguistic barriers and increasing accessibility through LOD and LOUD principles
- implementing the CARE principles through a thoughtful application of LOD and LOUD principles
- development of educational or Open Educational Resources (OERs) to increase the use of LOD

We encourage presenters to describe the problems addressed based on real-world datasets and to formulate proposals for solutions, preferably demonstrating (prototypes of) realised data-driven (web-) applications. Due to the thematic relevance, we target a broad and diverse audience, and the challenges described should also be integrated into an archaeological context (excavation, museum, archive, etc.).

This session is organised by the CAA SIG on Semantics and LOUD in Archaeology (SIG Data-Dragon). The core aim of this SIG is to utilise the SIG format to raise awareness of Linked Data in archaeology by creating a friendly and open platform for discussing and further developing semantics, as well as LOUD and FAIR data in archaeology.

References

Berners-Lee, T. (2006) Linked Data - Design Issues [online]. Available from: https://www.w3.org/DesignIssues/LinkedData.html.

CIDOC CRM (2024) Definition of the CIDOC Conceptual Reference Model, Version 7.1.3, ISO 21127:2023 [online]. Available from: https://cidoc-crm.org/Version/version-7.1.3.

Hylandet, B. et al. (2013). Linked Data Glossary [online]. Available from: https://www.w3.org/TR/ld-glossary/.

McCrae, J. P. et al. (2025) The Linked Open Data Cloud [online]. Available from: https://lod-cloud.net/.

Panagiotopoulos, D. & Trognitz, M. (2025) Prerequisites for a computational approach to Minoan chronology. *Archaeometry*. [Online] 67 (S1), 110–130. doi: 10.1111/arcm.13066.

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Thiery, F. & Thiery, P. (2023) Linked Open Ogham. How to publish and interlink various Ogham Data? *Archeologia e Calcolatori*. [Online] 34 (1), 105–114. doi: 10.19282/ac.34.1.2023.12.

Thiery, F. et al. (2023a) 'Object-Related Research Data Workflows Within NFDI4Objects and Beyond', in York Sure-Vetter & Carole Goble (eds.) *Proceedings of the Conference on Research Data Infrastructure*. [Online]. 7 September 2023 Hannover: TIB Open Publishing. CoRDI2023-46. [online]. doi: 10.52825/cordi.v1i.326.

Thiery, F. et al. (2023b) A Semi-Automatic Semantic-Model-Based Comparison Workflow for Archaeological Features on Roman Ceramics. *ISPRS International Journal of Geo-Information*. [Online] 12 (4), 167. doi: 10.3390/ijgi12040167.

Vrandečić, D. & Krötzsch, M. (2014) Wikidata: A free collaborative knowledgebase. *Communications of the ACM.* [Online] 57 (10), 78–85. doi: 10.1145/2629489.

Wilkinson, M. D. et al. (2016) The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data*. 3160018. doi: 10.1038/sdata.2016.18.

S2: Our Little Minions pt. VII: Small Tools with Major Impact

Session Organisers:

Brigit Danthine, Austrian Archaeological Institute (Austrian Academy of Science), Vienna, Austria

Ronald Visser, Saxion University of Applied Sciences, Deventer, Netherlands

Florian Thiery, Research Squirrel Engineers Network, Mainz, Germany

Session Format: Other

Description

In our daily work, small, self-made scripts (e.g., Python or R), home-grown small applications (e.g., QGIS Plugins), and small hardware devices significantly help us get work done. These little helpers ("little minions") often reduce our workload or optimise our workflows, although they are not often presented to the outside world and the research community [1]. Instead, we generally focus on presenting the results of our research and use our small tools silently during the process, without even pointing to them, especially not to the source code or building instructions. This session will focus on these "little minions", and we invite researchers to share their tools so that the scientific community may benefit. As we have seen in last year's "minion talks" since 2018, there is a wide range of tools to be shared. The Little Minion software tools have evolved from their niche existence into essential components of projects and consortia. They are a significant part of the archaeological Research Software Engineering community (also known as Computational Archaeology) and play a crucial role in the Research Data Management (RDM) process within the Research Data Lifecycle and the digital object biography [2]. This can result in, for example, FAIRification Tools [3-4] and research tools for reproducible quantitative/spatial analysis used in international and interdisciplinary initiatives, such as the German National Research Data Infrastructure (NFDI) [5-7], the European Collaborative Cloud for Cultural Heritage (ECCCH), or ARIADNEplus.

This seventh Little Minion session invites short presentations, lightning talks (max. 7-10 minutes, including very brief discussion), of small coding pieces, software, or hardware solutions at any stage of completion, not only focusing on fieldwork or excavation technology, associated evaluation, or methodical approaches in archaeology. Each talk should explain the innovative character and mode of operation of the digital tool. The only restriction is that the software, source code, and/or building instructions must be open and freely available. Proprietary products cannot be presented, but open and freely available tools are designed for them. To support the subsequent use of the tools, the goal should be to make them open and available to the scientific community (e.g., GitHub, GitLab).

We invite speakers to submit a short abstract, including an introduction to the research tool, a link to the repository (if possible), access to the source code, and an explanation of which group of researchers could benefit from the tool and how. The tools may address the following issues, but are not limited to:

- data processing tools and algorithms
- measuring tools
- digital documentation tools

- GIS plugins
- hands-on digital inventions
- data-driven tools

After the previous year's spontaneous success of “Stand-up-Science”, you will also have the opportunity to spontaneously participate and demonstrate what you have on your stick or laptop. If you would like to participate without submitting an abstract in the spontaneous section of the session, please don’t hesitate. Please come and spontaneously introduce your little minion!

The Minion session is designed for interested researchers from all domains who want to present their small minions, with a focus on the technical domain, as well as for researchers who wish to explore the types of little minions available to help with their own research questions. We all use minions in our daily work, and often, tools for the same task are built multiple times. This online session provides a platform for tools that are usually considered too unimportant to be presented in traditional talks, but are crucial and extensive steps in our research.

As a result of the session, we aim to provide support, ensuring that all the presented tools and links to code repositories are available to the research community on our website https://littleminions.link.

A sub-group of the CAA SIG Scientific Scripting Languages in Archaeology (SSLA), the “little minions”, organises this session. The core aim of this SIG is to focus on the application of Scripting Languages in archaeological research.

Other Format Description

This seventh Little Minion session invites short presentations, lightning talks (max. 7-10 minutes, including very brief discussion), of small coding pieces, software, or hardware solutions at any stage of completion, not only focusing on fieldwork or excavation technology, associated evaluation, or methodical approaches in archaeology. Each talk should explain the innovative character and mode of operation of the digital tool. The only restriction is that the software, source code, and/or building instructions must be open and freely available.

After the previous year's spontaneous success of “Stand-up-Science”, you will also have the opportunity to spontaneously participate and demonstrate what you have on your stick or laptop. If you would like to participate without submitting an abstract in the spontaneous section of the session, please don’t hesitate. Please come and spontaneously introduce your little minion!

References

[1] Thiery, F. et al. (2021) Little Minions in Archaeology: An open space for RSE software and small scripts in digital archaeology. *Squirrel Papers*. [Online] 3 (4). doi: 10.5281/zenodo.4575167.

[2] Thiery, F. et al. (2023) ‘Object-Related Research Data Workflows Within NFDI4Objects and Beyond’, in York Sure-Vetter & Carole Goble (eds.) *Proceedings of the Conference on Research Data Infrastructure*. [Online]. 7 September 2023 Hannover: TIB Open Publishing. CoRDI2023-46. [online]. doi: 10.52825/cordi.v1i.326.

[3] Thiery, F. et al. (2024) Research Software Engineering in NFDI4Objects: Community building, implementation of FAIRification Tools and scripting in Computational Archaeology. *Squirrel Papers*. [Online] 6 (3), #2. doi: 10.5281/zenodo.10774878.

[4] Thiery, F. et al. (2025) Research Squirrel Engineering Community-driven grassroots Research FAIRification Tools (RFAIRT) coded from Humanities and Geosciences. *Squirrel Papers*. [Online] 7 (3), λ3. doi: 10.5281/zenodo.14886032.

[5] Thiery, F. et al. (2024) Research Software Engineering within the NFDI (INFRA-WG-RSE). *Squirrel Papers*. [Online] 6 (4), #26. doi: 10.5281/zenodo.14167106.

[6] Thiery, F. & Flemisch, B. (2025) Research Software Engineering in the NFDI (INFRA-WG-RSE). *Squirrel Papers*. [Online] 7 (3), λ5. doi: 10.5281/zenodo.14898391.

[7] Thiery, F. et al. (2025) How to improve the visibility and added value of RSE(s) in NFDI. *Squirrel Papers*. [Online] 7 (3), λ8. doi: 10.5281/zenodo.14976365.

S3: Methodological and Theoretical Research in Digital Archaeology

Session Organisers:
Anja Wutte, University of Cologne, Germany; TU Wien, Austria
Maria Sotomayor Chicote, University of Cologne, Germany

Session Format: Standard

Description

Methodological and theoretical research in computational archaeology, perhaps with a few exceptions, is mainly characterised by the adoption of methods and theoretical concepts from other disciplines. What can be regarded as theoretical archaeology is primarily the import of methods that are adopted and applied by archaeologists, but little discussed and not significantly further developed. These methods, of course, have a theoretical basis, which is then also referred to in the publications or summarised. However, it usually remains an application to archaeological sources, which is neither about a critical 'review' of the underlying theory nor about its further development, but primarily about gaining more, better or even just different insights into the past. To put it somewhat cynically, the impression rises that there is still no theoretical archaeological discourse. (Atzbach 1998; Karl 2015; Rebay-Salisbury 2011).

This session therefore emphasises the need for and importance of methodological and basic research in digital archaeology. The topics of submitted papers may cover, but are not limited to, the following topic groups.

Archaeotecture: Projects and work in the interconnecting field of archaeology and architecture focus on the development of innovative digital methods in relation to architectural cultural heritage and include areas of building recording, data processing, documentation and the development of customised analysis options.

Technical innovations and Solutions: Technical innovations and solutions play an important role in the further development of archaeological research. Archaeologists use technical means to support and expand traditional methods. They have a major impact in the processes of searching, analysing, documenting and presenting finds. Existing solutions are usually adapted for this purpose, but archaeologists themselves can also contribute to improving technical processes and establishing innovative solutions. This sub-area aims to create space to advance modern archaeology on a technical level.

AI in Archaeology: Artificial intelligence has fundamentally changed the possibilities and forms of archaeological research of visual data. Large amounts of data can be analysed and processed in a short time, which optimises long-term research by saving human and financial resources. AI can support archaeologists in their work and establish itself as a strategic tool. For this reason, one section is dedicated to projects that deal with the further development and adaptation of AI-supported methods for archaeology.

Spatial Relation and Modelling: Major goals of archaeology are to document archaeological cultural variability, understand culture-environment relationships, human-landscape interaction and in general describe and understand the behaviors of past populations (Banks, 2017). Considering this, interaction of various kind is the main driver of historical, cultural, social and economic processes. Archaeologists very frequently deal with variants of interaction while there is still room for improving a generalised concept of interaction (Nakoinz 2013).

Digital Data Management: Archaeologists increasingly rely on digital data. A successful data management concept concerns data storage, archiving and preservation as well as data accessibility and usability. Therefore, this topic is dedicated to best practice achievements and organisation of digital archaeological materials.

Teaching and Education: Digital archaeology is transforming not only research, but also how we teach and engage with archaeological knowledge. This section explores how methods such as archaeogaming, gamification and digital simulations support critical pedagogy in classrooms and museums. We welcome works that reflect on digital tools as spaces for theoretical exploration, methodological training and public engagement.

We invite contributions from all backgrounds and research areas that reflect on the role of archaeology within the wider scientific and technological landscape. This session aims to foster critical discussion around the adoption, implementation and development of digital methods. We particularly welcome interdisciplinary approaches and methodological innovations applicable across different archaeological contexts. Theoretical papers reflecting on these aspects are equally encouraged.

References

Atzbach, Rainer. 1998. „Vom Nutzen und Nachteil der Archäologie. Ein Aufruf zur Theoriediskussion.“ *Archäologisches Nachrichtenblatt*, 3–5.

Banks, William E. 2017. „The application of ecological niche modeling methods to archaeological data in order to examine culture-environment relationships and cultural trajectories“, Quaternaire, 28 (2), 271–76. https://doi.org/10.4000/quaternaire.7966.

Karl, Raimund. 2015. „Wo ist die Grundlagenforschung“, Ethnographisch-Archäologische Zeitschrift, 56.1/2, 50-53.

Nakoinz, Oliver. 2013. „Spatial Models of Interaction and Economic Archaeology“, Metalla, Nr. 20.2, 87–115.

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S4: Computer Applications in South Asian Archaeology: Digital Innovations in Heritage Research and Preservation

Session Organisers:

Kamani Perera, Chartered Institute of Personnel Management
E M N Perera, Supreme Court of Sri Lanka
Anushka Earskin, Chartered Institute of Personnel Management
Indika Wijayasriwardana, Union Bank Colombo PLC

Session Format: Standard

Description

The digital preservation of archaeological heritage is gaining unprecedented significance in South Asia, a region marked by historical depth, cultural diversity, and vulnerability to urbanization, climate change, and conflict. This session explores how emerging technologies—3D scanning, GIS-based modeling, virtual reconstructions, and digital repositories—are transforming documentation, conservation, and interpretation practices across India, Sri Lanka, Nepal, Bangladesh, and Pakistan. Beyond technological demonstrations, the session critically examines challenges of accessibility, data sovereignty, and digital ethics, with particular attention to decolonial and community-centered frameworks. Case studies will highlight innovative yet resource-conscious approaches to safeguarding endangered sites and integrating indigenous knowledge systems into digital heritage. By fostering dialogue among archaeologists, technologists, and policy-makers, this session aims to strengthen regional collaboration while contributing to global debates on equitable digital stewardship. It situates South Asia as both a beneficiary and contributor to international discourse, offering transferable insights for sustainable and inclusive digital heritage futures.

Session Rationale and Objectives

South Asia is home to a vast and diverse range of archaeological heritage, covering from the ancient Indus Valley Civilization and Anuradhapura's monumental ruins to medieval Buddhist monasteries in Bangladesh and Islamic urban forms in Pakistan. However, increasing threats such as urbanization, climate change, looting, neglect, and political conflict have rendered many sites vulnerable. Traditional conservation approaches, while important, are often insufficient in ensuring long-term access and safeguarding the information embedded in these cultural assets.

In response, digital preservation—encompassing digitization, 3D scanning, GIS mapping, virtual reality reconstructions, and digital repositories—has emerged as a vital complementary tool for archaeological conservation in the region. Yet, the practice of digital heritage preservation in South Asia remains fragmented, underfunded, and often disconnected from local communities. Furthermore, issues of digital colonialism, data ethics, intellectual property, and capacity gaps hinder the realization of truly inclusive and sustainable digital preservation practices.

This session is proposed to bring together archaeologists, digital humanists, heritage professionals, technologists, archivists, and policy-makers to:

1. Showcase recent initiatives, technologies, and methodologies in digital preservation of archaeological heritage in South Asia.
2. Explore the socio-political, ethical, and infrastructural challenges of digital preservation in the region.
3. Discuss inclusive and community-centered frameworks for digital archiving and access.
4. Strengthen transnational and interdisciplinary collaborations among stakeholders.
5. Envision pathways for regional digital heritage networks that promote resilience, equity, and cultural continuity.

Relevance to CAA Beyond Geographical Vicinity

While the session focuses on South Asia, its relevance extends far beyond regional borders. The methodological, ethical, and collaborative dimensions align closely with CAA's mission:

- **Methodological Innovation:** South Asia offers low-cost, high-impact applications of computational tools (e.g., photogrammetry with drones, open-source GIS) that can inspire globally transferable models for heritage management under resource constraints.
- **Ethical and Epistemic Contributions:** The focus on decolonial, community-based digital practices contributes directly to global debates on knowledge equity, data ownership, and digital colonialism in archaeology.
- **Scalability and Data Diversity:** The region's archaeological range—from prehistoric cities to sacred landscapes—provides a unique testbed for adapting computational methods across varied heritage typologies.
- **Transnational Collaborations:** By aiming to establish a South Asian digital heritage network, the session advances South–South and South–North cooperation, strengthening the global digital archaeology community.
- **Contribution to CAA's Mission:** By bringing underrepresented regions into dialogue, this session promotes inclusivity and global diversity in computational archaeology.

Session Themes and Topics

The session welcomes paper presentations and project demonstrations under (but not limited to) the following themes:

1. **Technological Innovations and Practices**

- 3D documentation of archaeological sites (e.g., photogrammetry, LiDAR, drone mapping).
- Virtual and augmented reality applications for public engagement and education.
- GIS-based mapping and predictive modeling of archaeological landscapes.
- Development of open-access digital archives and metadata standards tailored to South Asian contexts.

2. **Case Studies from the Region**

- Site-specific digital preservation efforts (e.g., Sigiriya in Sri Lanka, Mohenjo-daro in Pakistan, Lumbini in Nepal, Mahasthangarh in Bangladesh, Hampi in India).
- Integration of local oral traditions and indigenous knowledge systems into digital heritage narratives.
- Digital storytelling and crowdsourced memory initiatives around archaeological heritage.

3. **Ethical and Legal Dimensions**

- Ownership, repatriation, and control over digitized archaeological materials.
- Data sovereignty and cross-border access to shared cultural heritage.
- Intellectual property rights, community consent, and safeguarding sensitive cultural knowledge.

4. **Capacity Building and Collaboration**

- Building local and regional expertise in digital heritage technologies.
- South–South collaboration and knowledge-sharing mechanisms.
- Role of universities, NGOs, and public institutions in fostering sustainable digital heritage ecosystems.

5. **Future Visions**

- Resilience of digital archives in the face of natural disasters and conflict.
- Artificial Intelligence and Machine Learning in archaeological research.
- Blockchain applications for provenance tracking and authenticity.
- Designing immersive digital heritage experiences for younger generations and diaspora communities.

Format and Structure

The session will be structured as a 90–120-minute panel, allowing for diverse formats:

- 3–5 academic paper presentations (15 minutes each).
- 1 project demo or virtual heritage experience (10–15 minutes).
- Moderated discussion and Q&A (20–30 minutes).

Target Audience

- Scholars and students in archaeology, digital humanities, heritage studies, South Asian studies.
- Archivists, museum professionals, and librarians.
- Technologists and digital preservation experts.
- Policy-makers and government officials in cultural ministries and departments.
- NGOs and community organizations working in heritage conservation.

Relevance to South Asia and Global Context

This session is timely and relevant as South Asian countries increasingly recognize the value of digital strategies in preserving their cultural patrimony. With growing digitization efforts (e.g., the National Digital Repository in India, Sri Lanka's Central Cultural Fund projects, UNESCO-supported archives in Nepal and Pakistan), there is an urgent need to build regional dialogue, share best practices, and confront common challenges.

At the same time, global frameworks such as the UNESCO Recommendation on Open Science (2021) and the Charter on Digital Heritage call for inclusive, rights-based approaches to digital heritage. This session contributes to advancing these goals from a South Asian lens, advocating for contextualized, ethical, and equitable digital preservation practices that empower local custodians while promoting global access and recognition.

Expected Outcomes

- A platform for presenting cutting-edge digital heritage research and practice in South Asia.
- Identification of common gaps, needs, and collaborative opportunities across the region.
- Recommendations for policy frameworks and funding models to support long-term digital preservation.
- Initiation of a regional network or working group focused on digital archaeological heritage in South Asia.
- Possible post-session publication or digital exhibition of featured projects.

S5: People from the Underground: Towards a Digital Archaeology of Subterranean Environments (preliminary version)

Session Organisers:

Konstantinos Trimmis, Australian Archaeological Institute at Athens
Ivan Drnić, Archaeological Museum in Zagreb
Sonia Machause Lopez, University of Valencia
Georgios Lazaridis, Aristotle University of Thessaloniki

Session Format: Standard

Description

Subterranean environments both natural – such as caves and rockshelters – and anthropogenic – such as catacombs, mines, tombs and so on – represent some of the most intriguing, complex, and methodologically challenging contexts for archaeological investigation. These enclosed and often disorienting spaces resist conventional archaeological approaches due to their spatial configurations, microclimatic variability, and technological constraints. Despite this, underground sites have long been central to human history and memory, hosting an array of human activities functional, economic, and spiritual. Today, digital archaeology offers new and transformative means for their exploration, recording, and interpretation.

Until the beginning of 2011 the dominant way of mapping a cave and its finds that can be found in literature was based on the compass and tape (or Electronic Distance meters (EDM) technique (Stratford, 2011). In this case the measurements are recorded by hand and are transported to a database. The mapping error rate in this case is quite large even if the results of this method whenever it was applied were satisfactory (e.g. see Moyes, 2002; Stratford, 2011). However technological advances in surveying instruments, survey data analysis, LED lighting, digital photography, photogrammetry, cave specific software and recently handheld lidar sensors and Terrestrial Laser Scanners have revolutionised the way that we survey underground spaces and any archaeology within (see Trimmis 2018; and papers in Büster et al 2019 for reviews). Equally specialised software applications (such as Therion) and cave specific workflows for digital recording are also emerging and challenge the difficulties for an underground digital archaeology (see examples among others at Drnić et al 2018; Gazes et al 2024; Redovniković et al 2014)

This session invites contributions that engage with digital methods in the documentation and analysis of subterranean archaeological sites. The aim is to create a platform for sharing innovations, confronting methodological challenges, and envisioning future directions for digital subterranean archaeology. From high-resolution 3D modelling and GIS-based spatial analysis to sensor-based environmental monitoring and virtual reconstructions, the digital toolkit for exploring the underground is rapidly expanding. At the same time, subterranean fieldwork presents persistent hurdles: the absence of natural light complicates optical recording; the lack of GNSS and RTK reception demands novel solutions for georeferencing; and the volumetric nature of underground sites resists traditional 2D mapping approaches.

We especially welcome papers that address:

- Innovative survey techniques in low- or no - light and signal-deprived environments, such as SLAM-based LiDAR, paperless mapping methods, handheld photogrammetry, structured light scanning, and integrated inertial systems.
- Multi-sensor approaches that combine visual, thermal, acoustic, and environmental data to better understand underground contexts.
- Geospatial data management in complex 3D spaces, including workflows that integrate underground datasets into broader landscape-scale analyses.
- Human-environment interaction studies in caves and artificial underground sites using spatial statistics, movement modelling, and sensorial reconstruction.
- Challenges in visualization and communication, including virtual and augmented reality applications that allow audiences to access and experience subterranean spaces remotely.
- Interdisciplinary collaborations involving speleologists, geologists, engineers, and conservation scientists to solve recording and interpretation problems.
- Preservation and monitoring strategies enabled by digital documentation, particularly in response to climate change, tourism pressure, and development threats.
- Theoretical and epistemological reflections on how digital tools reshape our understanding of underground spaces as landscapes of material practice, memory, and myth.
- The session also encourages contributions from practitioners working in other disciplines that intersect with digital subterranean work, such as architectural documentation of tunnels or bunkers, forensic recording of underground conflict heritage, and digital humanities projects engaging with underground mythologies or urban substructures.

By bringing together an international community of researchers working " underground" this session seeks to advance a dialogue on how subterranean spaces challenge and inspire digital archaeology, and how our tools and methods must evolve in turn. The discussion will contribute to developing best practices and shared standards for subterranean fieldwork and data integration, while also promoting critical thinking about the conceptual models we apply to space, visibility, orientation, and embodiment underground.

Let’s illuminate the underground—digitally.

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S6: Unlocking Hidden Treasures: Digital Methods as the Key to Open Archaeological Collections for Research and Teaching

Session Organisers:
Louise Tharandt, Humboldt-Universität zu Berlin
Anna Gnyp, Humboldt-Universität zu Berlin
Sophie Schlosser, Ostbayerische Technische Hochschule Regensburg

Session Format: Standard

Description

University and museum collections represent a rich and diverse array of archaeological objects, assembled over decades through research, excavations, donations and looting. These collections often contain unique and significant objects that have the potential to greatly enhance our understanding of past and recent cultures and societies (Wissenschaftsrat, 2011). However, the full research potential of these collections often remains untapped for various reasons. Besides funding, university and museum collections face a multitude of obstacles that hinder their accessibility and usability. This can make it difficult for researchers to discover and access sufficient and relevant material. The dispersal of objects across different locations can lead to the fragmentation of assemblages and the loss of contextual information. Unknown origins and bias in data limit our understanding of history. Furthermore, the lack of dedicated resources and expertise for collections management can result in inadequate preservation and documentation, further exacerbating these issues. Digital methods and tools can make a significant contribution to addressing these issues. Through the digitisation of objects or data and the use of semantic databases up to machine learning algorithms it is possible to (re)discover hidden or inaccessible data, and reunite dispersed objects across different locations and institutions. Ethical and legal aspects of collection objects can be addressed more effectively. The potential of collection objects as teaching resources could be utilised and expanded upon.

This session aims to explore new approaches in which researchers, educators, and collection managers are leveraging university and museum collections to advance archaeological knowledge and practice. By bringing together a diverse range of perspectives and experiences, we hope to stimulate a productive dialogue on the role of university and museum collections in archaeology, enhancing their use in a way that is appropriate to their significance. We also seek to showcase creative and effective strategies for working with collections (Andraschke & Wagner, 2020). We invite contributors to share their experiences and insights on how to leverage digital methods, to unlock the hidden treasures within these collections and maximise their potential for research, teaching, and public engagement.

We welcome papers addressing (but not limited to) the following topics:

1. **Revealing Collections:** Efforts to create or enhance digital catalogues, databases, and 3D repositories to increase accessibility and preserve objects virtually. This can include

discussions on the use of digital methods such as photogrammetry, laser scanning, or linked opened data and open data infrastructures (Wagner et al., 2019) to create immersive and interactive experiences with collections.

2. **Unearthing Data:** Data science methods to uncover, integrate, analyse, publish and long-term archive previously hidden, inaccessible or new data from collections. This can include open science practices, the use of advanced data mining techniques, machine learning algorithms (Brandsen et al., 2020), 3D digitisation and crowdsourcing initiatives to extract valuable information from unstructured or poorly documented datasets and to permanently archive the data.

3. **Considering Ethical Aspects and Repatriation:** Addressing the ethical dimensions of archaeological collections, including the provenance, display, and description of objects, using digital tools (Shad et al., 2024). This involves provenance research, supporting repatriation efforts (Krupa & Grimm, 2021), and fostering collaboration with descendant, Indigenous, and local communities. We particularly welcome submissions on decolonising collection practices and co-creating knowledge through inclusive, dialogue-based approaches that honour cultural sovereignty and lived heritage.

4. **Reuniting Dispersed Collections:** Strategies to bridge gaps between objects split across different locations, institutions, or databases, recontextualise scattered finds and recombine or reconstruct fragmented objects (Roßberger et al., 2018). This can involve collaborative efforts between universities, museums, and other cultural institutions to share data and resources (Galanakis & Nowak-Kemp, 2013).

5. **Teaching (with objects):** Case studies demonstrating how scientific collections have been employed through digital methods in archaeological research projects or as teaching tools, fostering hands-on learning and research-led teaching. This can include innovative pedagogical approaches that integrate digital or tangible collections into the curriculum (Callieri et al., 2023), as well as student-led research projects that utilise university collections.

6. **Engaging, Collaborating, Transforming:** Initiatives that connect collections with local communities, museums, and other institutions via digital means, encouraging public engagement and interdisciplinary collaboration (Wessman et al., 2019). This can include 3D visualisations, outreach programs, exhibitions, citizen science projects and public lectures that showcase the significance of university or museum collections and their relevance to contemporary issues. Contributions on how collections can be improved or expanded accordingly are equally welcome.

We encourage submissions from researchers, educators, and collection managers at all career stages. By sharing best practices, success stories, and lessons learned, we hope to inspire more effective use of university and museum collections and foster a network of scholars dedicated to their study and preservation.

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S7: Reframing the Past: Cognitive, Psychological, and Computational Approaches to Interpreting Artefact Function

Session Organisers:

Silvia Stein, Independent Researcher and active EAA and CAA member
Sergii Makhin, Clinical Psychologist and Docent at V.I. Vernadsky Crimean Federal University, Ukraine
Stefan Zechner, Technische Universität Wien, Technische Physik, Faculty Member

Session Format: Standard

Description

This session seeks new ideas in archaeology for re-describing alternative artefact function though we also welcome new ways in which computational methods, can inform 1. cognitive processes, 2. brain evolution, 3. intellectual evolution, and 4. tool function. An example is the new idea that 100-72 thousand years old (kya) punctured shells not only had ornamental value, they had a functional value as fishing tools. “Interpreting shells found in archaeological contexts is not straightforward. They can be food remains, personal ornaments, or objects used in “black magic” (cf. Léo Neto et al. 2012); fishing nets (cf. Stein and Pacheco 2025); and counting devices (cf. Overmann 2016)” (Mouclier, et al, 2025). This re-description of punctured shells as fishing tools for nets has more explanation power that the evolution of the parietal lobe occurred in relation to early use of string in fishing, shell weights and ornaments 115 70 kya (Stein & Pacheco, 2025), besides the role of the bow and arrow, about 80 kya (Lombard, 2025).

This session invites contributions that explore how archaeology or cognitive science, psychology, neuroscience, and computational methods can enrich our understanding of artefact function in past societies. Traditional interpretations often emphasize symbolic or ritual perspectives, we cannot “resort to this explanation when they do not understand a feature” (Marchand, et al, 2021). An example is the symbolic description of punctured shells as ornamental necklaces and headbands, when a new functional fishing use or re-description has been tested with computer imaging and experimental reconstruction of a fishing net weight system, establishing that brain parietal lobe evolution preceded by 40,000 years the brain evolution associated with the bow and arrow (Stein & Pacheco, 2025, & Lombard, 2025).

This session promotes work in cognitive and experimental archaeology (Bruner, 2020, Stout, et al, 2017, Wadley, 2024, & Wynn, et al, 2024,) integrating the role of artefacts into models of the evolution of human perception, motor coordination, memory, and decision-making.

The session seeks to question established interpretations of artefact function, though we also welcome papers on how computational and quantitative approaches like digital imaging and use-wear provide new insights into cognitive, visual, motorial and spatial processes. We are

interested in how these processes underly tool use, production, and perception. For example, neuroarchaeological approaches link brain regions such as the precuneus to complex tool-related activities (Bruner et al., 2018 & Lombard, 2024), while agent-based modeling and machine learning can help evaluate alternative scenarios of artefact function (Eleftheriadou, et al, 2025)- Similarly, computer modeling, digital photo editing, VR/AR environments, and eye-tracking experiments have been employed to investigate how artefacts afford certain behaviors and how perception shapes functional interpretation (Stout & Hecht, 2017; Bruner, 2017).

We particularly encourage contributions that:

- Use experimental archaeology combined with computational or quantitative analysis to test functional hypotheses.
- Apply neurocognitive or behavioral frameworks to reinterpret artefact functions.
- Demonstrate how visualization tools and synthetic reconstructions (e.g., digital "synthetic memories") can shift interpretative paradigms (Stein & Pacheco, 2025).
- Explore bias detection and reflexivity in archaeological interpretation through digital media or quantitative analyses such as use-wear.

Bringing together diverse approaches, this session seeks to show how artefacts can be understood as products of both material and cognitive processes**.** Our scope is to create a dialogue that situates archaeological evidence within broader models of human evolution, highlighting how computational and quantitative methods can inform questions in psychology and neurosciences regarding cognition, perception, and motorial function, and not merely address the issue of the symbolic value of an artefact when archaeologists "do not understand a feature" (Marchand, et al, 2021)**.**

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S8: Digital Methods in Rock Art Research II. Connecting People: Reconstructing the Contexts of Past Visual Communication Systems

Session Organisers:
Ashely Green, University of Gothenburg (chair)
Rebecca Döhl, Humboldt-Universität zu Berlin (chair)
Eymard Fäder, University of Cologne (chair)
Paolo Medici, Centro Camuno di Studi Preistorici (chair)
Oliver Vogels, University of Cologne

Session Format: Standard

Description

This year we are expanding the session's focus to the digital explorations of the creation, perception, and social circumstances of production and consumption of rock art and related visual communication systems.

The context for the formation and use of visual communication systems, such as rock art (including petroglyphs and paintings), wall art, or graffiti, is mainly analysed through formal methods of interpretation (Taçon and Chippindale, 1998). During the last decade these formal methods shifted more to digital and computational methods, comprising a wide range of approaches, applications, and techniques (Carrero-Pazos et al., 2022; Valdez-Tullett and Figueiredo Persson, 2023). These methods cover well-established GIS-centred analysis of the spatial context of rock art, computational analysis (including AI approaches) of rock art production, and extended reality (XR) applications for cultural heritage and engagement. On both the local- and large-scale, digital and computational methods play an important role in understanding visual communication systems and the people that created them.

To highlight the people behind the visual communication, this session aims to explore all aspects of social engagement with rock art from its creation to its consumption and the feedbacks within these processes. While we refer to rock art as a prime example of visual communication, we embrace all expressions of semantic visuality, such as graffiti, visual marking systems, wall art etc. We welcome contributions on methods, new insights and results from digital methods, and dissemination around the **human-centred lifecycle of rock art**:

Creation – Digital methods can highlight the underlying concepts, formal as ideational, and techniques used to establish certain motifs and topics and their application on the canvas. For example, digital analysis of techniques employed for shaping the figures (Díaz-Guardamino, 2023) and the analysis of panel composition, style, and chronology (Riris and Oliver, 2019).

Position – The spatial and socio-economic context of visual communication production provides another aspect of exploration which allows for digital methods. From studies of the placement of rock art in the landscape (Barnett et al., 2024; Döhl, 2019; Vogels et al., 2021) to the role that natural features played in the creation of rock art (Horn et al., 2023), digital

methods play an important role in the multi-scalar analysis of art. Similarly, the interplay between graffiti and their application on built environments and trees are explored with digital methods.

Perception – Understanding perceptions in visual communication systems builds another immanent connection to the people who used the art. Visual perception and analysis using digital methods, such as eye-tracking, can help further understanding of systems and societies who created them (Silva-Gago et al., 2025). Archaeoacoustics (Díaz-Andreu and Mattioli, 2016; Rainio et al., 2025; Santos da Rosa et al., 2023) with sound propagation and soundscape measurement have also showed a great potential for exploring the perception and social role of rock art.

Consumption – The consumption of rock art and other visual systems might be explored both in its original context and in its modern form. The mediation and presentation of rock art and its (original) context to a modern audience, in cultural heritage projects or museums, relies heavily on digital methods (Jalandoni, 2025). Interactive web-based platforms (Green et al., 2024), direct enhanced access like XR applications (Urcia et al., 2022; Westin et al., 2021), or reconstruction of caves (Lascaux, Chauvet) based on digital 3D-models (Geneste, 2009), for example, offer accessible ways for researchers and the public to consume rock art.

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S9: AI Applications in Cultural Heritage and Archaeological Protection

Session Organisers:

Dante Abate, ERATOSTHENES Centre of Excellence
Fabio Remondino, Fondazione Bruno Kessler
Donna Yates, Maastricht University
Hector A. Orengo, Barcelona Supercomputing Centre

Session Format: Standard

Description

Illicit excavations and the trafficking of cultural property remain serious transnational threats, often linked to organized crime and conflict-related instability. Addressing this challenge requires interdisciplinary collaboration and the integration of innovative digital tools. Artificial Intelligence (AI) and Machine Learning (ML) are emerging as game changers in this domain, enabling the processing and analysis of vast and complex datasets at unprecedented speed and accuracy. These technologies can rapidly identify, classify, and monitor archaeological features and artifacts across extensive spatial and temporal scales, enhancing early detection and response capabilities. Such analytical power is particularly valuable in countering the growing challenges of illegal excavations and the illicit trafficking of cultural property, where timely insights can make a decisive difference in safeguarding heritage assets.

This session invites contributions from researchers, heritage professionals, law enforcement agencies, technologists, and policymakers working on AI- and ML-driven approaches to cultural heritage protection.

To ensure thematic clarity, submissions should align with one or more of the following sub-strands:

- remote sensing and site detection,
- artifact recognition and provenance analysis,
- predictive modelling of looting risk,
- integrated monitoring and early warning systems.

Contributors are requested to report validation methods, datasets, metrics, and limitations to ensure methodological transparency and comparability.

A diversity and inclusion statement is encouraged, and mechanisms to broaden participation (such as cross-regional partnerships, involvement of early-career researchers, and engagement of underrepresented groups) are strongly supported.

Finally, all submissions should include an explicit section on ethics and safeguarding, addressing data sensitivity, potential dual-use risks, and responsible disclosure, thereby ensuring that technological innovation proceeds with full consideration of cultural, legal, and societal responsibilities.

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S10: Exploring Past Senses. Digital Tools and Methodologies for Sensory Archaeology

Session Organisers:

Kamil Kopij, Institute of Archaeology, Jagiellonian University

Alexander Braun, University of Cologne

Session Format: Standard

Description

How past humans experienced their environment is one of the greatest challenges in archaeology. Audible, visual, and olfactory stimuli shaped human perceptions, experience, memory, responses. These stimuli were, in turn, influenced by human actions across diverse social contexts.

In recent years, computational methodologies have proven that it is possible – within reasonable limits – to model aspects of human sensory experience. With the growing availability of digital tools, archaeologist are increasingly exploring how past humans experienced their environment and how they shaped it in response and in regard to sensory stimuli.

Advances in digital tools provide exciting new prospects for analysing these experiences, their functions, and their interactions with individuals. These advancements foster the development of new synergies and methodologies, allowing for more comprehensive investigations.

This session invites discussion of both established and emerging tools and methodologies to approach the questions of sensory archaeology: what did people experience in the past – and how? What information can we gleam with our approaches on a theoretical and empirical level about past humans and their societies? But also, what are the limitations, and biases introduced by our data and methods?

S11: Reframing Cultural Properties Rather than as “Relics of the Past” but as “Objects that Stimulate Modern People's Perception, Sensibility, and Meaning-Making”

Session Organisers:
Fujita Haruhiro, Niigata University of International and Information Studies
Kawano Kazutaka, Tokyo National Museum

Session Format: Standard

Description

a) Background of this session

This proposing session is a continuous one of the session "Cognitive Mind" organized and held at CAA 2025, of which we enforced the session by adding EEG/ERPs components, for better understanding of body reactions against stimuli and emotional categories.

b) VR and MR from instant 3D view to eye fixation experiment with emotion and impression

VR (Virtual Reality) and MR (Mixed Reality) represented a significant advancement by enabling viewers to see and simulate things that are not normally visible. Artefacts converted to 3D can be easily visible by VR/MR equipment, therefore one can obtain instant experience of viewing ancient artifacts.

Microsoft HoloLens2 is capable of capturing the viewer's gaze data using its built-in cameras and sensors. This data includes the 3D coordinates of the fixation point, the direction of the gaze, and the fixation duration (saccades and fixations), serving as indicators of where a person's potential cognition is directed on an object. By projecting the duration of gaze fixation on the surface of the object as color-graded information, it can be visualized as a 3D heatmap.

c) Measuring cognition using SD Method

As an experimental method for extracting the mental images people have when viewing objects, the Semantic Differential (SD) method is widely used in psychological testing. This

method involves providing pairs of simple sensory impression adjectives, such as "beautiful-ugly," for subjects to rate on a scale. The SD method serves as crucial information to analyze how people perceive objects as stimuli through many simple sensory impression adjectives. A research paper using this method is now published as a proceedings of CAA [1].

d) Reconstructing the Cognition Using Deep Generative Models

After a long period of stagnation, machine learning experienced a major turning point with deep learning for image recognition in 2012. Over the past 12 years, advancements in deep learning models have led to cognition analysis capabilities far exceeding human abilities. Recently, these models have been applied to cognition analysis as part of information psychology. By analyzing sensory impressions of subjects viewing artifacts along with data on these objects, deep cognition models offer new insights.

e) Prediction of Emotional Response Categories Using Event-Related Potentials (ERPs)

Event-related potentials (ERPs), which capture the temporal responses of the brain to visual stimuli, contain features that reflect differences in stimulus categories and cognitive processing, serving as key indicators for emotion classification and semantic comprehension. For visually presented object groups—such as Jōmon pottery and clay figurines—that differ in shape and semantic interpretation, repeated ERP measurements make it possible to construct models that predict the category of emotional responses to stimuli based on electroencephalographic (EEG) data. In July 2025, emotional label measurements were conducted with a total of 306 participants in Japan and Malaysia. Given the observed fact that many participants recorded gaze trajectories associated with a single emotional label, we became confident that extracting ERPs from EEG measurements synchronized with such single emotional labels would enable the development of models capable of predicting emotional response categories [2] [3].

f) The Need for Cultural Property Cognition Studies Session

Cognitive cultural property studies, deeply intertwined with experimental psychology and cognitive information processing, is a crucial field for exploring human psychology and the cognition through archaeological artifacts and sites. However, aside from the presentation proposed by the authors at CAA2024, no relevant research was identified.

While it is impossible to directly investigate the cognition of ancient people, it is considered feasible to reconstruct their cognition and mental images under the assumption of commonality with modern human cognition, which were proposed by Burner and Matsumoto. Therefore, this group of founders and organizers proposes a Cultural Property Cognition Session, as a continuous from one session held in CAA 2025.

g) Possible investigations and methodologies

- 3D views of artifacts by VR/MR equipment and investigations on observers' perception
- VR/MR practices for regional historical education
- VR/MR exhibition as digital museum
- Eye and gaze tracking methodologies for cognitive investigations

- Electroencephalographic (EEG) / Event-Related Potentials (ERPs) studies
- Any cognition related investigations and methodologies
- Deep learning models/deep generative models on cognition

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S12: Data Management Plans in Practice - Expectations, Implications and Real-World Experiences

Session Organisers:

Lizzie Scholtus, Institute of Prehistoric and Protohistoric Archaeology, Kiel University

Steffen Strohm, Department of Computer Science, Kiel University

Session Format: Standard

Description

In recent years, **Data Management Plans (DMPs)** [1] have become an integral part of project proposals in archaeology and beyond. Promoted by funding bodies, institutional policies, and a growing awareness of open science, they aim to ensure transparency, reusability, and long-term accessibility of research data. However, while DMPs are widely recognised as a necessary instrument in digital research workflows, their implementation in the context of active archaeological research often reveals gaps between formal requirements and practical realities.

In former sessions and roundtables we discussed good practices in handling research data. Some raised issues were located outside of research itself: lack of funding to hire RDM staff; lack of prioritization in the proposal phase and after the project. In order to move forward, we would like to address those practical issues, which are realistically in reach and can be improved, through thorough discussion with researchers and RDM practitioners.

This session will critically explore the practical use of DMPs in archaeological research, answering the following main question: **How can we improve DMPs in practical research** in order to make them more **accessible** in the beginning, more **applicable** throughout the project and transparently **assessable** towards the end.

The session aims to provide a balanced perspective on the **benefits, challenges, and evolving expectations** around DMPs. On the one hand, they offer potential for better planning, coordination, and reproducibility; on the other, they often introduce additional overhead, especially for smaller teams or projects without dedicated support. The need for structured training, clear responsibilities, and dynamic adaptability in the face of evolving project scopes is increasingly evident. While much of the discourse around DMPs focuses on policy and infrastructure, this session will emphasise **practical, case-driven experiences**.

Throughout the session, we aim to foster an open and constructive exchange between all participants and audience, discussing relevant actors and roles (see Figure) involved in data management:

1. **Funders** specifying expectations,
2. **Researchers and subproject teams** who must interpret and implement DMPs in specific research contexts, and
3. **Collaborators and institutions**, academic or otherwise, who share responsibility in managing, curating, and reusing data.

The session will be structured unconventionally, combining short talks and longer discussion. It will be divided into two parts. In **Part 1**, contributors will deliver a short talk (see details below), followed by questions and room for discussion focusing on specific issues raised in each case. This structure is designed to move quickly through multiple perspectives while allowing for reflection and clarification. In **Part 2**, we will open the floor for a broader discussion. Audience members will be invited to share their own insights, experiences, and concerns—whether they have worked with DMPs themselves or are preparing to do so.

We encourage participants to provide feedback that reflect on the role and reality of DMPs within their own projects -- regardless of whether those experiences were positive, negative, or ambivalent. The short talks (5-10min) should cover major aspects of:

- What kind of project was it, and what role did the DMP play?
- Who was responsible for creating, implementing, and evaluating the DMP?
- Were external specialists involved?
- What challenges arose during the creation or application of the DMP?
- Was the DMP adapted over time, and how?
- Were data and results ultimately made available as initially planned?
- What types of training or institutional support were available—or lacking?
- How were problems with funders, collaborators, or data infrastructure handled?
- What lessons were learned, and how could future DMP practices improve?

We encourage researchers at all levels and from all domains of and around archaeological research to submit **abstracts** (max. 300 words) addressing their experiences with DMPs from a perspective utilising (some of) the points listed above. Abstracts should focus on concrete experiences rather than theoretical frameworks, and we welcome both success stories and critical reflections. The goal is to build a realistic picture of how DMPs function on the ground - and discuss how they might evolve to better serve the needs of active archaeological research.

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S13: If I Had a Hammer, I'd 3D-Scan It: Computational Approaches for the Analysis of Tool Artifacts

Session Organisers:

Anastasia Eleftheriadou, Institute for Digital Cultural Heritage Studies, Ludwig Maximilian University of Munich, Germany

Guillermo Bustos-Pérez, Department of Human Origins, Max Planck Institute for Evolutionary Anthropology, Leibzig, Germany

João Marreiros, Laboratory for Traceology and Controlled Experiments (TraCEr) at MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, Leibniz-Zentrum für Archäologie (LEIZA), Neuwied, Germany

Session Format: Standard

Description

Technology can be defined as a socially transmitted, multidimensional system that integrates raw materials, operational sequences, behaviors, cognitive processes, and the knowledge and intentions underlying the creation and use of products (Kozatsas, 2020; Schiffer and Skibo, 1987). Tools, as tangible expressions of this system, offer insights into human behavior, as their design, manufacture, and use can reflect adaptive responses to ecological, demographic, and sociocultural conditions (Foley and Lahr, 2003; Hovers, 2012; Kuhn, 2020).

Recent advances in computational methods have transformed the ways archaeologists document, analyze, and interpret tools made from materials such as stone, bone, wood, and metal (e.g., Calandra et al., 2019; Courtenay et al., 2020; Luncz et al., 2022; Marreiros et al., 2020). The adoption of high-resolution 3D modeling has grown steadily since the early 2010s, with applications now well established across a range of artifact types (Courtenay et al., 2019; Proffitt et al., 2023; Wyatt-Spratt, 2022). Since 2018, the use of machine and deep learning techniques has likewise expanded (Bellat et al., 2025; Eleftheriadou et al., 2025; e.g., Courtenay et al., 2024; Luncz et al., 2022; Sferrazza, 2025). Together, these developments are broadening the scope of archaeological studies, enabling comparative analyses across diverse raw materials, chronological periods, and geographical regions.

This session invites papers that apply or critically engage with computational methods in the analysis of lithic, bone, wood and metal tools. We encourage contributions using (but not limited to):

- **3D and surface-based methods:** Photogrammetry, laser scanning, micro-CT, and surface metrology for documenting and analyzing tool morphology and use-wear.
- **Geometric morphometrics:** 2D or 3D landmark-based approaches, including outline and shape analyses.
- **Machine learning and AI:** Supervised and unsupervised methods (e.g., SVMs, tree-based classifiers), deep learning approaches (e.g., convolutional neural networks), for tasks such as segmentation, classification, and pattern recognition.
- **Computer vision and image analysis:** Techniques such as edge detection, segmentation, and texture quantification.
- **Simulation and modeling:** Agent-based modeling, biomechanical simulations, and virtual experiments.
- **Spatial and network analysis:** Geographic information systems (GIS) and network analysis methods.
- **Open science, databases, and interoperability:** Development of FAIR-compliant datasets, ontologies, and reproducible workflows.

We particularly welcome studies that address known challenges in the field, such as equifinality, small or imbalanced datasets, taphonomic overprinting, and the integration of heterogeneous data types. Case studies, methodological advances, experimental validation, and theoretical reflections are all encouraged. By bringing together archaeologists, material scientists, and computational specialists, this session demonstrates how advanced digital methods can reveal new insights into human behavior through the study of tool production and use.

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S14: Fighting Crime with Computational Archaeology

Session Organisers:

Wouter Verschoof-van der Vaart, Netherlands Forensic Institute
Hayley Mickleburgh, University of Amsterdam, Faculty of Humanities
Mike Groen, Netherlands Forensic Institute

Session Format: Standard

Description

In recent decades, countries across the globe have adopted archaeological theories, methods, and techniques within the context of criminal and judicial investigations, for example in the investigation of clandestine or mass graves, buried evidence, human remains, and heritage crimes (Barone & Groen 2025). This use of archaeological theories, methods, and techniques for the investigation of medico-legal and humanitarian cases defines the field of forensic archaeology (Blau & Ubelaker 2016). It involves the systematic documentation, recovery, and interpretation of material evidence, such as human remains, artefacts, and features from outdoor or complex crime scenes, that fall under criminal or legal inquiry.

Criminal investigations are increasingly data intensive, requiring efficient data processing, secure storage, and advanced analytical tools. Like conventional archaeology, forensic archaeology increasingly employs computational methods and techniques, including geospatial analysis and modelling using GIS, geophysical surveying, remote sensing, 3D-scanning, 3D-modelling, augmented reality, and virtual reconstructions. These methods provide important opportunities to efficiently and accurately collect data that meet the strict criteria for legal investigations. For example, a study comparing UAV-based photogrammetry to laser scanning showed near equal accuracy and precision for both methods of 3D data capture, demonstrating the suitability of UAV-based photogrammetry for rapid, non-invasive documentation in hazardous or logistically challenging environments (Cunha et al. 2022).

While the technical requirements and capabilities of computational methods and techniques in forensic archaeological contexts remain largely similar to those in conventional archaeology, forensic archaeology operates within legal frameworks and must adhere to chain-of-custody procedures. The routine application of digital and computational approaches therefore faces specific challenges in forensic contexts, including adaptation to the requirements of law enforcement agency workflows, the necessity for validation of techniques used in legal and judicial procedures, the integration of these approaches within

criminalistics frameworks, and the need for rigorous security measures for sensitive data management.

This session aims to discuss the latest computational developments in the field of forensic archaeology, with particular emphasis on their potential for improving investigative outcomes and to explore how forensic archaeological practice can inform broader archaeology. Due to its fundamental requirements of secure and standardized data handling, careful handling of ethical sensitivities, and strict chain-of-custody procedures, forensic archaeology can offer valuable lessons for developing **robust digital practices** that benefit broader archaeology.

This session centers on computational innovations applied to or specifically adapted for forensic contexts. We invite contributions surrounding, but not limited to the following major topics:

- Locating, mapping, and visualizing outdoor and/or complex crime scenes such as outdoor scenes, clandestine graves, and mass graves;
- The investigation of heritage crimes (in conflict zones), such as looting;
- Geographical and criminological modeling and the use of geospatial analysis tools such as viewshed analysis and RAG maps within a forensic context.

We ask session presentations to reflect on:

- How forensic contexts affect the requirements of the data itself, procedures for data handling, workflows, etc.;
- Transferable lessons to (and from!) conventional archaeology;
- Gaps in current knowledge and threats to current practice;
- Strategies for standardization and validation of methods and techniques for use in forensic and/or (medico)legal contexts;
- Opportunities to develop open and ethical training resources.

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S15: MuVAMoLa Part Two: Multivarite Approaches to Mortuary Landscapes

Session Organisers:
Timo Geitlinger, University of Zurich
Tucker Deady, University of Toronto

Session Format: Other

Description

Mortuary scholarship has perhaps one of the longest histories in archaeological research, but it is a history riddled with bias based on visibility, durability, and public interest. Often most evident in regions where burial practices were accompanied by the erection of monumental architecture, the inclusion of sensational objects, or carry imaginary cultural significance, mortuary contexts have drawn in significant amounts of research. Early scientific endeavors yielded abundant contextual data on burial monuments, ritual behavior, and interred objects. Due to the quality of documentation, however, through locational, temporal and financial predispositions, legacy datasets tend to be heterogenous and noisy and have large gaps in the types of information collected and recorded (see Cooper et al. 2022). Quantitative analyses of mortuary practices are thus commonly met with specific data-related challenges that have proven themselves obstacles in methodological proceedings. How do we therefore reconcile with this biased history of research while still utilizing the documented material and moving forward into more collaborative conversations within both computational and theoretical scholarship?

Mortuary behavior is inherently linked to individual and group identity and should be seen as both agents creating cultural and social connections *and* manifestations of these relations. Simultaneously, burial construction and material inclusions are highly selective and cannot be taken to represent a daily reality of the associated people (Porter 2016). As archaeologists, we must ask how we can use the information we gather from burials, intentionally closed contexts, and speak about the living people and the materialization of their self-perception. Likewise, the placement of tombs within specific environments reveals complexities of cultural expressions that permeate past landscapes. The spatial significance of mortuary evidence in association with material culture, when placed under the scrutiny of quantitative analyses, can further enhance the theoretical and methodological approaches to

archaeological landscapes as a whole. While early pioneers of computational archaeology conducted quantitative analyses to study burial contexts within individual sites (Hodson 1968), more recent studies use network analysis (Bourgeois and Kroon 2017; Sosna 2023), and principal components and correspondence analyses (Kjeld Jensen and Høilund Nielson 1997; Kassabaum 2011), amongst other multivariate methods (Nakoinz 2013), to study large scale landscape connections of mortuary contexts.

The session is built to bring together scholars from diverse backgrounds who study burials through multivariate quantitative approaches who are interested in discussing qualitative implications, best (and worst) practices, and potential caveats for future scholarship. In this second iteration of MuVAMoLA, we propose a two-part framework. Part one is in preparation for the conference and includes a submission approximately one month before the meeting of a short summary (this could simply be an adapted abstract) of your overall research and images. The intention is to create an interactive platform to provide conference-goers a prelude to the session with the further goal of turning it into a publishable format. Part two is the meeting itself which will be structurally akin to a traditional paper workshop of short presentations, creating an environment centered on questions and discussion. To accommodate for more flow and direct conversation, papers will be approximately 7 minutes long and the aim for each will be to focus on a specific method, question, or theoretical topic out of your larger research. The session will be split into themes depending on the topics submitted and each thematic section will have a discussant. We invite authors who:

- Apply and work on multivariate methods to burials and their landscapes
- Develop methodological or theoretical frameworks for the successful application of multivariate and/or spatial methods to study burial contexts.

Please submit a regular length abstract and indicate a specific area you plan to focus on for the conference. Prior to the meeting, we will be in touch regarding your part one submission. We will also be happy to work with session presenters on narrowing their focus for shortened talks and preparing for this discussion-based gathering.

Other Format Description

We propose a two-part framework.
Part one is in preparation for the conference and includes a submission approximately one month before the meeting of a short summary (this could simply be an adapted abstract) of contributors' overall research and images. The intention is to create an interactive platform to provide conference-goers a prelude to the session. There will be a link in the final program to access this.
Part two is the meeting itself which will be structurally akin to a traditional paper workshop of short presentations, creating an environment centered on questions and discussion. To accommodate for more flow and direct conversation, papers will be approximately 7 minutes long and the aim for each will be to focus on a specific method, question, or theoretical topic out of their larger research. The session will be split into themes depending on the topics submitted and each thematic section will have a discussant.

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S16: "All Models are Wrong": Learning from Failure in Computational Archaeology

Session Organisers:

Joe Roe, Department of Cross-Cultural Regional Studies, University of Copenhagen, Denmark

Matteo Tomasini, Gothenburg Research Infrastructure in Digital Humanities & Department of Literature, History of Ideas, and Religion, University of Gothenburg, Sweden

Session Format: Standard

Description

Box's oft-quoted law—"all models are wrong, but some are useful" (Box 1976)—tells us that the value of a model is not in precisely reproducing the real world, but failing to do so in a productive way. This is nowhere truer than in computational archaeology, the search for mathematical approximations of a fundamentally unreproducible past. We are voracious producers and consumers of new digital methods, tools, and perspectives (Scollar 1999; Batist and Roe 2024). It is only to be expected that most of these end up going nowhere. Yet only successful models tend to make it into conferences and publications; the lessons we learn from 'failed' attempts are kept private.

In this session, we call for papers on: models that failed verification, or turned out to be unverifiable; new approaches tried that didn't work; errors in implementation, large and small; methods and tools that have been left on the wayside; and any other form of failure in computational archaeological research.

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S17: Channels of Change - Interdisciplinary Approaches to the Archaeology of Fluvial Environments

Session Organisers:

Martin Offermann, Institute for Geography, University of Leipzig, Leipzig, Germany

Chiara G. M. Girotto, Labor für Prähistorische Anthropologie, Munich, Germany

Iris Nießen, Working Group "Historical Anthroposphères", LeipzigLab, University of Leipzig, Leipzig, Germany & Department of Medieval Archaeology, University of Tübingen, Tübingen, Germany

Lukas Werther, German Archaeological Institute, Romano-Germanic Commission, Frankfurt, Germany

Session Format: Standard

Description

Integrating, collating, and holistic interpretation of inter- and transdisciplinary modes of research, evidence, and ideas has long been a part of investigating the past. In recent decades, this approach to archaeological research has been expanded by the ever-growing availability of high-resolution datasets, including satellite imagery, lidar, paleoenvironmental proxies, sediment archives, ancient DNA, isotopic analyses, ethnographic and detailed excavation records. These sources span scales from microscopic material analysis to regional climate modelling, and from single events to processes lasting millennia.

Floodplains are especially suited to such integrative approaches. As dynamic socio-environmental zones where hydrological, geomorphological, and ecological processes intersect with centuries or even millennia of human activity, they preserve exceptional cultural and natural archives. However, in Central Europe up to 95 % of floodplains have been altered or destroyed through embankment, drainage, channelisation, damming, and settlement expansion. These transformations reflect long-term interactions between climate variability, catchment-scale processes, and direct anthropogenic forcing.

Werther et al. (2021) define such heavily modified systems as part of a Fluvial Anthroposphere. The onset of these conditions varies regionally, reflecting environmental

settings, historical trajectories, and cultural practices. In Central Europe, major transitions occurred in the medieval and preindustrial periods, driven by intensified land reclamation, hydroengineering, and resource exploitation. Adopting the Fluvial Anthroposphere framework in archaeology means bridging qualitative based evidence (typologies, texts, maps, oral traditions) with quantitative evidence (geomorphological mapping, sediment stratigraphy, palaeohydrological models, geochemistry, biodiversity records). The aim is to create interoperable frameworks that preserve disciplinary focussed approaches whilst enabling joint analysis.

Understanding the long-term coevolution of river systems and societies has practical value for floodplain management, biodiversity conservation, climate adaptation, and heritage preservation. Restoration strategies benefit from recognising that many “natural” baselines are products of centuries of human alteration. Integrating archaeological and historical perspectives ensures such strategies are both ecologically sound and culturally informed.

We invite submissions of case studies, methodological papers, and theoretical reflections from any geographical or chronological context, provided they address the central theme of the session. Possible contributions include but are not limited to:

- Integrating archaeological, historical, ethnographical, stratigraphical, palaeoenvironmental, hydrological, and chronological data into unified models of floodplain formation, transformation, and occupation histories and to reconstruct cultural practices, land-use strategies, and socio-political responses to riverine and floodplain dynamics over centuries or millennia
- Applying quantitative tools to heterogeneous cultural and environmental datasets to identify cross-scale patterns and socio-natural feedbacks.
- Developing visualisation tools that represent multi-scalar and multi-temporal relationships in floodplain and riverine archaeology, integrating both qualitative narratives and quantitative measurements.
- Addressing uncertainty, chronological variability, and error propagation when integrating datasets from diverse disciplinary and methodological origins.
- Reflecting on epistemological and methodological challenges in uniting qualitative evidence with quantitative data, ensuring interpretative balance across disciplines and scales.

Contributions from early-career researchers and projects involving interdisciplinary collaboration across fields such as archaeology, paleoenvironmental science, anthropology, history and computer science are particularly encouraged.

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S18: Connecting the Americas: A Pan-Regional Dialogue among CAA Chapters

Session Organisers:

Giacomo Fontana, Texas Tech University, USA (chair)
Eduardo Herrera Malatesta, Leiden University, Netherlands (chair)
Grégoire van Havre, Universidade Federal do Piauí, Brazil (chair)
Diego Jimenez Badillo, Instituto Nacional de Antropología e Historia, Mexico (chair)
Brian Crane, Maryland-National Capital Park and Planning Commission, USA

Session Format: Other

Description

This panel brings together representatives from the network of CAA regional chapters across the Americas, including CAA North America, CAA Mexico, CAA Brazil, and CAA Latin America & the Caribbean, for an open dialogue on the shared challenges, research interests, and collaborative opportunities that define computational archaeology in the region.

As the global CAA community continues to grow, chapters in the Americas have emerged within diverse socio-political contexts, facing distinct but often overlapping issues such as uneven access to digital infrastructure and training, linguistic diversity, funding limitations, and the ongoing need to decolonize archaeological knowledge production and digital methods.

While CAA chapters in Europe benefit from longer-established networks and more consistent inter-chapter collaboration, regional coordination in the Americas remains comparatively underdeveloped. This panel seeks to address that gap by fostering dialogue among American chapters and articulating the specific needs and priorities shaped by local conditions, including political instability, institutional fragmentation, and barriers to international cooperation.

The goal of the panel is twofold: first, to explore concrete opportunities for collaboration across American chapters, such as co-organized events, shared resources, and training initiatives, and second, to identify common research priorities that could benefit from sustained cross-regional engagement. These may include digital heritage management, open science practices, spatial and landscape analysis in diverse environments, community-based digital archaeology, and ethical considerations around data sovereignty and representation.

The panel will also reflect on the growing movement of students, researchers, and archaeological projects that cross national borders within the Americas. These transregional academic flows present both challenges and opportunities for building inclusive, context-sensitive approaches to computational archaeology.

By convening this discussion among chapter representatives and the session audience, the panel aims to lay the foundation for sustained inter-chapter collaboration that reflects the diversity, complexity, and potential of archaeological practice in the Americas. It represents both a recognition of ongoing efforts and a step toward a more connected, responsive, and regionally grounded CAA community.

Other Format Description

The session will be structured as a panel discussion among representatives from different CAA chapters in the Americas. Giacomo Fontana will serve as moderator, with Eduardo Herrera Malatesta representing Latin America and the Caribbean, Diego Jiménez Badillo representing Mexico, Grégoire van Havre representing Brazil, and Brian Crane representing North America. The goal is to facilitate an informal conversation focused on exploring opportunities for collaboration, while also addressing the growing funding and political challenges we all face. Following an initial structured discussion among the panelists, the floor will be opened to the audience for questions and to share their perspectives.

S19: Structuring the World Beyond: Analytical and Computational Approaches towards Protohistoric and Early Medieval Funerary Data

Session Organisers:

Marek Vlach, Institute of Archaeology of the Czech Academy of Sciences, Brno
Balázs Komoróczy, Institute of Archaeology of the Czech Academy of Sciences, Brno
Marek Hladík, Institute of Archaeology of the Czech Academy of Sciences, Brno
Katarína Hladíková, Slovak National Museum, Archaeological Museum, Bratislava

Session Format: Standard

Description

Funerary contexts have long been regarded as a key component of archaeological data for understanding past societies, where burials and funerary areas serve as a bridge between the world of the living and the realm of the deceased (Pearson, 1999). Despite differing perspectives on their potential for shedding light on past societies and their structuring (Tainter, 1978, Binford, 1971, Saxe, 1970, Hodder, 1984, Härke, 2000, Steuer, 1982), they occupy a central role in many theories about social structures, beliefs, and cultural practices. The variability and structure observed in archaeological data on funerary contexts (such as grave furnishings and grave goods) reflect the complex realities of past societies, encompassing the characteristics of the buried individual, their relatives, and the community. Traditionally, archaeologists are primarily examining mortuary remains through qualitative typochronological analysis; however, the available tools and methods, the scale of burial data, and associated natural scientific datasets (e.g., metallography, isotopic analysis, genomics, palaeopathology) enable new and innovative approaches to analyse both qualitative and quantitative aspects of the mortuary record. Today, advances in computing and digital methodologies are transforming the field, from statistical models to machine learning, enabling the extraction of meaningful patterns from burial context data.

Beyond the traditional "visual" identification of grave clusters, statistical spatial analysis methods such as Ripley's K-function or kernel density estimation are increasingly used to identify structures and clusters within cemeteries based on objective metrics and hypothesis testing (Sayer, 2020). These results can be further integrated into complex relational models using Structural Equation Modelling (SEM), enabling the testing of hypothetical links between spatial organisation, social factors, and chronology. Such combined approaches can reveal whether cemeteries were organised into small nuclear clusters or large, heterogeneous "households" used over long periods, and can analyse relationships with sex, age, status, or the chronology of the buried individuals.

This session concentrates on computational methods for analysing archaeological and natural scientific data on burial records, focusing on the Protohistoric and Early Medieval periods in Europe (though relevant contributions from other regions and periods are also encouraged). These transitional eras exhibit diverse mortuary practices and extensive burial grounds that greatly benefit from data-driven analysis. The session aims to demonstrate how modern computational archaeology can offer new insights into burial evidence, whether shedding light on social hierarchy, ritual variations, demographic trends, population health standards, or cultural connections across regions. Addressing longstanding questions (e.g., new frameworks to measure prehistoric grave wealth) deepens understanding of how the living world has influenced and extended into the perception of the 'beyond' within past societies. In addition to established tools and techniques, the application of artificial intelligence (AI) and machine learning in archaeology can pioneer new frontiers in funerary archaeology, enabling researchers to recognise complex patterns and make predictions that were previously impossible.

Methodologically, the session is open to the full spectrum of computational techniques and tools. We invite researchers to present studies employing any computational methods to analyse burial data. Possible topics and approaches include (but are not limited to):

- **Spatial analysis** of burial ground layouts, intra-site and/or inter-site spatial analyses, topographic integration, and environmental context
- **Chronological modelling of burial sequences** through the Bayesian modelling, aoristic analysis, etc.
- **Social differentiation through grave goods patterns**, including wealth indexing, distributional modelling, and identity metrics across larger datasets
- Multi-proxy integration of **archaeometric, bioarchaeological, and environmental data**
- **Advanced spatial statistics (Ripley's K-function, nearest neighbour analysis, kernel density) combined with Structural Equation Modelling (SEM) to test hypothetical relationships**
- **Simulation and network modelling of mortuary behaviour**, kin groupings, prestige display systems, and ideological transformation
- **Machine learning and AI** in various aspects of funerary record archaeological data in classification and pattern recognition
- **Meta-analyses or comparative studies** of burial practices across cultural, temporal and spatial contexts

By highlighting such diverse approaches, the session will emphasise how these tools and methods can help to address various research questions, transforming raw data from graves

into meaningful narratives about past societies. The session aims to foster dialogue between specialists in computational methods and archaeologists working on funerary contexts. We welcome contributions from Europe and beyond, as comparative perspectives can deepen understanding of universal and regional patterns in burial practices and enhance knowledge of Protohistoric and Early Medieval necropolises.

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S20: Digital Archaeological Collections as AI Training Data

Session Organisers:
Vera Moitinho de Almeida, University of Porto & INESCC
Nevio Dubbini, University of Pisa
Aurore Mathys, Royal Museum for Central Africa & University of Liège
Gabriele Gattiglia, University of Pisa

Session Format: Standard

Description

As the digitisation of archaeological collections accelerates, the field is witnessing a transformative shift in how data are produced, curated, shared, and analysed. Digital databases, archives, and repositories — from site records and objects to high-resolution 3D scans, satellite imagery, and grey literature — are increasingly being enriched and repurposed as training data for artificial intelligence (AI) systems. AI has been applied to a broad range of tasks, such as archaeological sites/objects detection from LiDAR data and aerial photographs, predictive modelling of site locations, automated feature extraction from remote sensing and other data, material provenance analysis, artefact classification, epigraphic transcription, semantic annotation of textual corpora, and data description and integration (Gattiglia 2025). At the core of all these advances lies a foundational component: **archaeological training data**.

This session explores the multifaceted role of **digital archaeological collections as training data for AI**, addressing the scientific opportunities, technical and methodological challenges, and social responsibilities that come with applying computational methods to cultural heritage data — issues also tackled by the Managing Artificial Intelligence in Archaeology (MAIA) COST Action CA23141 (2024-2028). Training data will provide novel perspectives for archaeological research on unprecedented scales. Yet, this shift also raises critical questions about data quality, interoperability, ethics, and sustainability.

Archaeological collections, by their very nature, are rich in contextual, typological, and spatial information, making them attractive for AI applications. However, their integration into computational pipelines requires careful consideration of data quality, standardisation, provenance, and cultural sensitivity. Digital archaeological collections are not neutral or static repositories, but highly heterogeneous and dynamic cultural artefacts shaped by different research traditions, historical collection practices, digitisation strategies, institutional priorities, legal frameworks, and budgetary issues, among others. Crucially, this session does not treat digital archaeological data as a mere technical resource, but as a complex cultural and scholarly artefact in its own right. When repurposed for AI, these collections become part of a complex pipeline of knowledge production — one that demands transparency, critical reflexivity, and inclusive governance.

At the core of our research is a commitment to Open Science, as promoted by the European Commission (2019–), as well as to the FAIR (Wilkinson et al. 2016; *Findable, Accessible, Interoperable, and Reusable*), CARE (GIDA 2018, Carroll et al. 2020; *Collective Benefit*, *Authority to Control*, *Responsibility*, *Ethics*) and TADA (Ivimey-Cook et al. 2025; *Transferable*, *Accessibility*, *Documented*, *Annotated*) data principles. These frameworks are essential not only for encouraging open access to research outputs, collaborative infrastructures, and citizen engagement, but also for fostering reproducible and transparent AI research. They help ensure that archaeological knowledge remains a shared public good, while empowering communities to retain control over their data and benefit from its use.

These principles serve as guiding frameworks for preparing archaeological comparative datasets for AI training in a way that maximizes scientific rigor and minimizes unintended harm. It requires deliberate effort: datasets must be curated with clear provenance, comprehensive metadata and paradata, and open licensing; data formats must support machine readability and semantic interoperability; repositories must be designed to facilitate long-term accessibility, cross-disciplinary querying, and reuse. Making data reusable entails not only technical compatibility but also rich documentation of context, uncertainty, and cultural sensitivity — factors that are critical in archaeology but often undervalued in AI workflows. Without these foundations, the reuse of archaeological data for AI risks becoming fragmented, opaque, exploitative, or even useless.

This session explores the dynamic intersection of digital archaeological collections and AI, focusing on both the potential and the challenges of using such datasets to train intelligent systems. What constitutes a high-quality training dataset in archaeology, and how do archaeological standards/practices align (or conflict) with AI data requirements? How can the inherent biases in archaeological data (e.g., resulting from archival practices or digitisation strategies) impact the performance and fairness of AI models? In what ways do AI applications risk reproducing or amplifying existing interpretations, narratives, or silences within the archaeological record? What are the emerging best practices for ensuring transparency, reproducibility, and ethical accountability in AI-augmented archaeological research?

Presentations may address a range of themes, including but not limited to:

- Case studies demonstrating the use of AI in archaeological collections;
- Producing and exploring currently openly available (small to large) archaeological benchmark datasets to test AI models;

- Current good practices and guidelines for preparing data files for AI training;
- Preparing, structuring, and curating archaeological datasets for AI training in compliance with Open Science, FAIR, CARE, and/or TADA data principles;
- Limits and problems linked to the creation and/or use of comparative digital collections for AI applications;
- Technical and ethical challenges of bias, representation, and generalization in AI models trained on archaeological data;
- Collaborative efforts and contributions to open, federated data infrastructures and training resources for AI in archaeology.

By bringing together diverse perspectives on the role of digital archaeological collections in AI data training, this session contributes to a broader discussion about the next generation of AI-driven archaeological research and the future of archaeological knowledge production. It encourages critical engagement with the tools and methods we use, while highlighting the possibilities for AI to support archaeological research. The goal is to chart a path forward for guidelines and best practices with ethically grounded, context-aware, and scientifically rigorous applications of AI in archaeology, supported by high-quality data and research practices.

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S21: Computational Approaches to Archaeology in Latin America and the Caribbean: Building Regional Dialogues

Session Organisers:

Sebastian Fajardo Bernal, Leiden University
Cristian Gonzalez Rodriguez, University College London
Yoly Velandria, Archaeological and Historical Conservancy, Inc.
Daniel Sanchez-Gomez, University of Lisbon

Session Format: Standard

Description

The newly created CAA Latin America and Caribbean Chapter provides a platform to connect the region's expanding network of researchers and practitioners applying computational approaches in archaeology and heritage. Across the region, there is an active and diverse community working on areas such as 3D reconstruction, digital heritage management, predictive modelling, GIS-based spatial analysis, remote sensing, archaeometry, human–environment modelling, and AI-assisted object reconstruction. These initiatives—developed in countries from the Andes to the Caribbean—often operate independently and face shared challenges related to accessibility, infrastructure, training, and collaboration.

This session seeks to bring these groups together to strengthen research networks that address local contexts, knowledge systems, and specific regional challenges. We invite contributions on computational archaeology in all its forms, including spatial analysis, predictive modelling, network and agent-based modelling, remote sensing, digital documentation, 3D visualisation, and machine learning. Case studies, methodological developments, and theoretical reflections are welcome, whether based on fieldwork, historical datasets, or experimental projects.

The session will highlight the conditions shaping computational research in Latin America and the Caribbean. These include limited digital autonomy, fragmented communication channels, and barriers to research mobility that restrict collaboration across countries and institutions. At the same time, the region offers fertile ground for innovation, drawing on its rich ecological and cultural diversity and supported by a vibrant network of researchers, Indigenous communities, and other local stakeholders eager to amplify their voices in global dialogues. By confronting these challenges while building on the region's strengths, the session aims to foster a more inclusive and diverse computational archaeology. It seeks to lay the groundwork for systematic and rigorous practice in the region, promoting sustained collaborations, shared digital resources, and long-term capacity building.

S22: Ethics in Digital and Computational Archaeology

Session Organisers:

Eduardo Herrera-Malatesta, University of Bonn
Aleks Michalewicz, The University of Melbourne
Alicia Walsh, Leiden University
Madisen Hvidberg, University of Calgary

Session Format: Standard

Description

The rapid development of technology in archaeology has introduced both new opportunities and new ethical challenges. The accessibility of advanced tools, from large-scale digitisation and remote sensing to artificial intelligence, has shifted the central question from "Can I?" to "Should I?" While frameworks such as the London Charter, the FAIR and CARE principles, and the CAA Ethics Policy offer valuable guidance, they often remain broad in scope. Their flexibility allows application across diverse scenarios, but it can also make translating them into everyday practice difficult. Ethical review processes frequently prioritise legal compliance, such as GDPR and privacy, reducing ethics to a procedural box-ticking exercise rather than a starting point for deeper reflection. This session reframes ethics as an ongoing, integral aspect of research design and practice, not an afterthought. We invite presenters to share first-hand accounts of ethical dilemmas encountered in digital and computational archaeology: what worked, what did not, and how solutions were reached. By openly discussing challenges and even "failings," we can collectively identify pathways toward more equitable, sustainable, and context-aware practice.

Topics include (but are not limited to):

- Implementing FAIR and CARE principles in practice,
- Environmental sustainability in digital projects,
- Codes of conduct for field, lab, and online work,
- Navigating ethical research in geopolitical conflict zones,
- Community engagement, co-creation, and restitution,
- Digitisation of human remains and culturally sensitive materials,
- Decolonial approaches to digital heritage,
- Lessons from other disciplines.

While we are interested in grounded, practice-based perspectives, we welcome theoretical discussions on any related topic or questions. For example, how do archaeologists adapt ethical guidelines to fit specific social, political, and environmental contexts? How can grassroots activism, public engagement, and institutional change work in tandem to shape ethical practice? What creative strategies emerge when principles meet the realities of funding bodies, governmental institutions, or community expectations? We also encourage reflections on the intersections between digital and broader archaeological ethics. Restitution, equitable access, intellectual property, accessibility for people with disabilities, and the stewardship of conflicted heritage all gain new dimensions when digital technologies are introduced. By examining these intersections, we can better anticipate the ethical implications of emerging tools such as 3D documentation, virtual and augmented reality, AI-driven analysis, and open data platforms.

With this session, we aim to foster a collaborative space for sharing experiences, learning from one another, and building adaptable roadmaps for the ethical use of digital technologies in archaeology. Through open dialogue, critical reflection, and cross-disciplinary exchange, we hope to strengthen ethics as a living practice, one that guides our decisions, shapes our relationships with communities, and ensures the responsible stewardship of archaeological heritage in a rapidly changing digital world.

S23: Augmenting Collections digitally: Augmented Reality as a Tool for Teaching and Dissemination in Scientific Collections and Museums

Session Organisers:
Sascha Schmitz, Universität des Saarlandes
Nils Schnorr, Universität des Saarlandes

Session Format: Standard

Description

Collections have long been central to teaching in object-based disciplines such as archaeology, art history, and anthropology. Traditionally, students learned description, classification, and analysis by working directly with original artifacts or large-scale plaster casts. Today, however, the expansion of these collections is limited by ethical, financial, and spatial constraints. At the same time, digitization projects in universities and museums are producing a rapidly growing number of 3D models, which open new opportunities for teaching, research, and dissemination (Günther et al. 2023).

This session focuses on the transformative potential of Augmented Reality (AR) and related digital technologies like Mixed Reality (MR) (for differentiation between these two, see e.g. Bekele 2021, 95-100) for higher education and museum practice. While Virtual Reality (VR) applications are already known from virtual museum projects (e.g. ExPresS XR, https://dikopa.net/2023/12/express-xr-ein-virtuelles-museums-tool/), AR remains underutilized (see Barrile et al. 2022, Munoz & Martí 2020 for examples), despite its capacity to enrich physical collections by placing digital reconstructions and comparative models right

next to real-world objects and displays. AR thus offers unique possibilities for knowledge transfer, critical engagement, and interactive learning (Spallone et al. 2024).

We invite contributions that address the role of AR and digital 3D documentation in object-based disciplines, with particular emphasis on teaching practices, museum dissemination, and data management. Topics may include, but are not limited to:

- AR applications in teaching and museum contexts, including case studies of courses or exhibitions.
- Student involvement in tool development, 3D documentation and reconstruction as part of curricula.
- Knowledge dissemination through AR, including strategies for engaging different audiences.
- Visualization of uncertainty and transparent documentation of reconstruction processes.
- Data management and "fairification" of complex 3D datasets for sustainable reuse.

By combining perspectives from archaeology, museology, and digital humanities, this session aims to foster discussion on both the opportunities and challenges of using AR in object-based disciplines. Contributors and attendees will exchange insights on practical projects, methodological approaches, and technical infrastructures, while also reflecting on how immersive technologies can shape the future of teaching and the public understanding of material cultural heritage.

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S25: How to do ROAD: An Essential Tool for Conducting Multidisciplinary Studies Related to Human Evolution

Session Organisers:
Christine Hertler, ROCEEH Research Center
Andrew W. Kandel, ROCEEH Research Center
Christian Sommer, ROCEEH Research Center

Session Format: Standard

Description

Computational analytical approaches have long been established in the study of human history, and they place increasing demands on data volume, structuring, and reliability. As a large-scale research database providing information about human evolution and cultural development, the ROCEEH Out of Africa Database (ROAD) represents an essential tool for researchers. Systematic data collection in ROAD covers Africa and Eurasia between three million and 20,000 years ago. The database contains information about 2,500+ sites and 26,000+ assemblages, with details on human fossils, their paleoenvironmental context in terms of associated fauna and flora, as well as artifacts and their behavioral and cultural interpretations (Kandel et al. 2023). Such a comprehensive warehouse of data prepares the way for integrative studies about the expansions of humans over the course of their journey through prehistoric times.

Most of the data contained in ROAD stems from 6,300+ published sources. Although the majority of data comes from scientific journals published during the last two decades, other sources include historical publications and/or data found in reports and through personal communications. ROAD also integrates data published in languages other than English

including other script systems, such as Cyrillic or Chinese. ROAD is curated and maintained by the ROCEEH team.

The Research Center "The Role of Culture in Early Expansions of Humans" (ROCEEH) explores expansions of early humans. The mobility of human groups resulting in large-scale dispersal patterns represents *expansions of range*. Such range expansions reflect changing patterns of resource use, that is, *expansions of the resource space*. In turn, such shifts are driven by changing conditions in the paleoenvironment due to climatic oscillations as well as expansions in sociocultural practices, namely *expansions of cultural performances*.

The ROCEEH team designed a set of tools which enables researchers to explore data in ROAD without direct support and/or in-depth knowledge of writing SQL queries. Examples of available applications in ROAD include: ROAD Site Summary Data Sheets for each locality entered; ROAD Simple Search, an easy-to-use interface to learn more about the contents of the database; WebGIS also known as the MapModule for basic mapping functions; Ask ROAD, an application which allows users to compose queries easily; and upcoming roadDB, a library for data retrieval and analysis using the R language. We will introduce and discuss the use of these tools in a separate ROAD workshop at CAA 2026.

In this standard session we invite and feature studies which have been conducted using ROAD data to illustrate the range of methods which can be applied to evaluate large datasets. Examples of the range of studies start with analyses of spatiotemporal patterns (Scerri & Will 2023), network analysis (Sommer et al. 2022) and paleoenvironmental studies (Archer 2021), but also covers diverse modeling approaches including niche modeling (Yaworsky et al. 2024), species distribution models (Timbrell 2024), and simulation-based approaches (Coco & Jovita 2025).

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S26: New Frontiers in Drone Applications

Session Organisers:
Jitte Waagen, University of Amsterdam
Matthias Lang, Universität Bonn
Manuel J.H. Peters, Max Planck Institute of Geoanthropology
Mason Scholte, University of Amsterdam

Session Format: Standard

Description

This session invites innovative contributions from the field of drone applications in field archaeology that explicitly go beyond well-established practices. In the last decade, we have seen the rapid rise of remotely piloted aircraft with multirotor and fixed wing platforms, while sensors are becoming increasingly affordable and easier to operate. As a result, we are now moving beyond the presentation of basic aerial imaging results or discussing the use of drone photogrammetry as a method for archaeological mapping and documentation.

These drone platforms are part of the wider remote sensing spectrum but occupy their own specific application niche, due to their unique capabilities in terms of sensor deployment, operational flexibility, and the acquisition of (extremely) high-resolution data. Despite their potential having been showcased frequently in different studies (Lang et al 2016), and the fact that small drones already become a common instrument in the field archaeologists' toolbox, much remains to be explored.

Numerous novel sensors have recently become feasible for deployment on drones, including (but not limited to) hyperspectral cameras, thermal sensors, single- and multibeam echosounders, ground-penetrating radars, and magnetometers. While some examples of their application in archaeology exist (Casana and Ferwerda 2024, Linck et al 2025, Stele et al 2023, Waagen et al 2022), their use remains underexplored, and systematic, ground-truthed case studies are needed to evaluate their effectiveness for archaeological UAV-based remote sensing.

Furthermore, for both state-of-the-art and more common sensor types, the factors which play a role in determining the visibility of archaeological features in the survey results (such as soil properties, seasonality, moisture conditions, and drone survey parameters) are still only partially understood. In this respect, the field of drone-based remote sensing in archaeology would greatly benefit from a stronger focus on explainability: not only showcasing where features become visible, but also critically examining why they only appear under certain conditions, while remaining invisible in other circumstances.

At the same time, the application of drone remote sensing beyond photogrammetry as a tool in different archaeological contexts, such as excavations (Waagen and van Hilst 2025), is only starting to appear, and great benefit can be expected from the integration of AI/ML-supported methodologies for the collection and analysis of extremely high-resolution and multi-modal datasets.

However, apart from technological innovation, the field of drone applications has yet to mature in other aspects; two examples are the development of well-considered integrative and multidisciplinary approaches within broader landscape archaeological research, and the development of FAIR documentation of operational procedures and data analysis workflows (cf. Lozić & Štular 2021).

In this session, we welcome contributions that showcase and evaluate novel developments with regards, but not exclusive, to:

- Modalities and scales of drone deployment
- Comparative sensor performance studies in different environments
- FAIR documentation workflows/procedures
- Advanced drone sensor applications, e.g. hyperspectral, thermal, LiDAR, magnetometry, GPR, etc.
- Application contexts, e.g. remote sensing over excavations
- Workflows and analytical procedures, incl. AI/ML approaches
- Integrative multidisciplinary approaches, e.g. drone remote sensing in combination with soil analyses/vegetation studies

In addition to presentations showcasing case studies and workflows related to drones, we also welcome papers on other types of autonomous vehicles dealing with these issues.

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S27: Digital Communities: Collaborative Archaeologies, Shared Authority, and Community-Led Technologies

Session Organisers:
Erica Maria Antoinette Van Vugt, University of Calgary
Zoe Cascadden Jassal, University of Calgary
Madisen Hvidberg, University of Calgary
Josephine Hagan, University of Otago

Session Format: Standard

Description

As digital tools and platforms become increasingly embedded in archaeological practice, they are reshaping not only how data is produced and disseminated, but also *who* gets to participate in those processes, and on what terms. At the same time, the decolonization of research paradigms and community-driven methodologies is expanding the field beyond traditional disciplinary boundaries. Community members, whether Indigenous Nations, local stewards, diaspora populations, or grassroots collectives, are claiming greater authority over their own heritage, memory, and material pasts. But while there is significant progress, much work remains to ensure that digital archaeological practices are not extractive, technocratic, or reproducing colonial patterns of control.

This session invites researchers, practitioners, and community partners engaging in **digital community archaeology** to share experiences, critical reflections, and visions for the future. We seek contributions that explore how digital technologies, such as GIS, 3D modelling, digital

storytelling, data infrastructures, and online repositories, can support *ethical, collaborative, and community-centred research*. Of special interest are papers focused on work with Indigenous and disenfranchised communities around the world, but we emphasize that "community" is not a singular or static category.

A key starting point for this session is the recognition that imperial frameworks have historically structured archaeological authority. As Silliman (2006) noted, archaeology often assumes that disciplinary expertise confers the sole right to interpret and control the material past, particularly with Indigenous belongings, sites, and narratives. This authority, grounded in Western academic training, often ignores or devalues other ways of knowing, especially those rooted in cultural, ancestral, or lived experience. In response, Indigenous archaeologies emerged to assert that Indigenous peoples have both the right and the knowledge to interpret and care for their own histories, lands, and cultural heritage (see Haakanson 2010; Simons et al. 2021; Supernant 2018; Yellowhown 2006 for example).

Indigenous archaeology is research conducted *with, for, and by* Indigenous people (Atalay 2006:283). It recognizes Indigenous ownership over land, heritage, and representation, and it prioritizes multivocality, relationality, and the incorporation of Indigenous worldviews (Lyons 2016; Sillar 2013). Digital tools can amplify these goals when used in respectful, community-guided ways, but they can also risk flattening or misrepresenting Indigenous perspectives if deployed without care.

Community archaeology overlaps with, but is not synonymous with, Indigenous archaeology. Typically defined as research-driven or led by the community, sometimes referred to as "archaeology from below" or "grassroots archaeology" (Marshall 2002; Londoño 2021). While community archaeology shares approaches similar to those in Indigenous-led work, its epistemological grounding may differ, particularly when the community in question is not Indigenous. Methods such as co-creation, shared authority, and transparent communication must be attuned to the specific histories, politics, and aspirations of each community (Lassiter 2005).

Decolonizing archaeology intersects with both, while maintaining its own focus: the critical interrogation of archaeology's entanglement with colonialism, modernity, and systemic inequity (Londoño 2021). However, it is not a single set of methods or a checklist—it is an ongoing political and relational commitment (Quinless 2022; Wilson 2008). When digital methods are folded into decolonizing work, questions of infrastructure, access, representation, and data sovereignty become especially urgent.

This session offers space to reflect on these intersecting frameworks through the lens of digital practice. How can digital tools be made to serve community needs, rather than institutional ones? What tensions arise when integrating digital platforms with non-Western knowledge systems? How are authority, authorship, and access negotiated in collaborative digital projects? And what new forms of connection, resistance, or care might emerge when communities use digital technologies to tell their own stories?

We particularly welcome contributions that address:

- Community-led or co-designed digital heritage projects
- Indigenous or grassroots uses of digital technology in heritage or research contexts

- Collaborative mapping, modelling, or digital storytelling
- Ethics of access, data sovereignty, and long-term stewardship
- Digital return, repatriation, and re-connection with heritage
- Pedagogies and training models for community-engaged digital archaeology
- Theoretical reflections on authority, knowledge production, and decolonization
- Institutional and structural challenges to doing this work sustainably

This session aims to foster dialogue across regions, research traditions, and community contexts. It is open to scholars, students, community members, and practitioners from any disciplinary background. Our goal is to bring together diverse voices and experiences that speak to the potential and the complexity of building *digital communities* in archaeology.

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S28: From Systems to Standards – and Standards to Systems: How Field-Testing Shapes International Archaeological Data Frameworks (including CIDOC CRM)

Session Organisers:

Jane Jansen, National Historical Museums, Arkeologerna
Stephen Stead, Paveprime Ltd
Chiara Girotto, Anthro-Lab (Labor für prähistorische Anthropologie)

Session Format: Standard

Description

In the evolving landscape of digital archaeology, certain fieldwork recording methods have emerged as "quasi-standards" not through top-down mandates, but through widespread adoption and practical refinement in commercial contexts. This session brings together leading providers of digital archaeological solutions and academics to explore how field-tested approaches are crystallizing into de facto standards that advance both commercial practice and academic research.

Drawing on the conference theme *"It's All About People,"* this session examines how daily interactions between archaeologists and digital tools shape standardization from the ground up. We explore how platforms, through extensive deployment across diverse commercial projects, have become laboratories for developing robust, internationally applicable recording standards. These systems, refined through thousands of hours of real-world use, offer crucial

insights for initiatives like **CRMarchaeo, the CIDOC CRM conceptual framework,** and the broader push toward FAIR data principles in archaeology.

Building on last year's FAIRification discussions, we examine the critical phase between initial implementation and established practice. Commercial archaeology operates at the intersection of regulatory compliance, scientific rigor, and practical efficiency—a unique position that has made it an unexpected but powerful driver of methodological standardization. Through examining case study implementations across multiple countries and project types, this session demonstrates how "testing through use" produces solutions that not only allow **systems to grow into standards** but also enable **existing standards to inform and shape system design**—a reciprocal process that benefits the entire archaeological community.

Four interconnected themes structure our discussion:

1. **From Systems to Standards – and Standards to Systems:** We examine how repeated use patterns across hundreds of commercial projects naturally converge toward common recording practices, while also exploring how formal standards provide guidance for system design and implementation. These organic standards, born from practical necessity merged with academic rigor and a desire to record and preserve maximum data in the most time-efficient and economic manner, often prove extremely robust and adaptable.
2. **Internationalization and Interoperability:** Commercial projects frequently cross borders, requiring systems that accommodate diverse regulatory frameworks, languages, and archaeological traditions. We explore how platforms initially designed for specific national contexts have evolved to support international collaboration, creating bridges between different archaeological traditions while maintaining local compliance requirements. This evolution directly supports CRMarchaeo and **CIDOC CRM** objectives for harmonized digital infrastructures across Europe and beyond.
3. **FAIR Data as Commercial and Academic Asset:** We explore how FAIR data principles, when embedded in recording systems, create value chains extending far beyond individual projects. Case studies demonstrate how data collected for development-led archaeology, when properly structured and documented, becomes invaluable for academic research, regional syntheses, and heritage management.
4. **CIDOC CRM:** A dedicated segment introduces participants to the **CIDOC Conceptual Reference Model (CIDOC CRM)** and its archaeological extension CRMarchaeo. This component demonstrates how CIDOC CRM aligns with existing commercial recording frameworks and provides pathways for mapping field data into CRM-based structures. Attendees will gain practical insights into how CIDOC CRM can bridge diverse datasets, enhance interoperability, and strengthen the long-term scholarly and heritage value of archaeological records.

Rather than viewing standardization as a technical challenge, we frame it as a fundamentally human process—shaped by user needs, refined through feedback, and validated through practical application. The session highlights how commercial archaeology serves as a crucial testing ground where theoretical approaches meet practical realities, demonstrating that the boundaries between commercial and academic data generation are increasingly blurred and mutually beneficial.

The session combines presentations with interactive demonstrations and structured discussion, allowing participants to explore real datasets and examine how standardized recording enhances research possibilities while meeting commercial project requirements. We conclude with a moderated panel discussion on future directions for bottom-up standardization and the role of practical experience in shaping international archaeological data standards.

S29: AI Across the Heritage Pipeline: From Algorithms through Fieldwork to Deliverables

Session Organisers:
Katherine Crawford, Chronicle Heritage
Tom Fitton, Chronicle Heritage

Session Format: Standard

Description

Artificial Intelligence and Machine Learning are increasingly becoming core components in various subfields of archaeology, with potential applications in desk-based assessments, remote sensing, field recording, and 3D modelling (e.g. Landauer et al. 2025; Stoean et al. 2024; Küçükdemirci and Sarris 2022). Many of these applications remain disconnected, however, with limited awareness across academic researchers, heritage specialists, and cultural resource management professionals of how these processes are applied, evaluated, and regulated (Gattiglia 2025; Griffin et al. 2024).

This session seeks to couple innovative use-cases of AI and ML with methodological rigor across the fields of archaeology, heritage studies, and cultural resource management. We intend to stimulate conversation and engagement on how we might consolidate best practices for AI/ML in archaeology by linking algorithmic/model innovation to measurable outcomes and transparent governance, advancing research applications that are scientifically robust, ethically responsible, and directly applicable to heritage management practices. We invite

contributions that present new models, architecture, or evaluation frameworks, as well as studies that demonstrate how these AI/ML methods can be embedded within end-to-end archaeological workflows and communicated to diverse stakeholders (Klein et al. 2025).

Recognizing that cultural heritage projects often rely on proprietary or sensitive datasets, we place particular emphasis on governance and reproducibility under contractual and confidentiality constraints. Developing guidelines and legislation such as the EU Artificial Intelligence Act are likely to result in archives and clients requiring transparent documentation, model disclosure, and reproducible evaluation. We especially welcome contributions that translate these requirements into pragmatic, operational practices for archaeology and heritage management.

The session will conclude with a discussant-led synthesis to draw out overarching themes, identify gaps, and facilitate a forward-looking conversation on the future role of AI/ML in archaeological research and heritage management.

Topics of interest:

- Scalable site/feature detection from LiDAR and optical imagery, optimizing false positives triage and ground truthing workflows.
- Multimodal fusions (e.g. LiDAR, historic maps, GIS layers) for improved detection and interpretation.
- Application of models for condition monitoring and compliance, from change detection to action thresholds.
- End-to-end AI pipelines including data acquisition, modelling, and client deliverables.
- Challenges or limitations of current AI tools within cultural heritage
- Governance for proprietary/sensitive data

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S30: Unstoppable Vision, Immovable Practice: An Adversarial Debate on Linked Open Dreams and the Reality of Archaeological Data Collection

Session Organisers:

Fabian Riebschläger, German Archaeological Institute
Helmut Schwaiger, Austrian Archaeological Institute
Lisa Steinmann, German Archaeological Institute
Brigitte Danthine, Austrian Archaeological Institute

Session Format: Other

Description

Adversity is the first path to truth.' (Lord Byron)

This year marks a quarter century since the publication of Tim Berners-Lee's influential vision of "The Semantic Web"[1]. Humanity's relationship to the internet has changed drastically since 2001, but especially in data-based research, few visions have remained as mesmerising and as promising as that of the Semantic Web. The paradigm of semantic data, together with related concepts such as knowledge graphs, Linked Open Data (LOD), ontologies and authority files / controlled vocabularies has produced a wealth of research and implementation work over more than two decades.

This vision of the Semantic Web has also swept across archaeology, a discipline which has a keen interest in making sense of complex, often incomplete or even subjective data that is, sometimes obviously sometimes subtly, linked conceptually and contextually, yet produced under highly varied research designs and data-collection practices.

However, the perceivable impact of all these semantic investments remains surprisingly small in everyday archaeological practice, which continues to be dominated by simple tabular and other conventional data structures. Moreover, recent advances in AI have suggested that general-purpose, data-driven methods often outperform carefully engineered knowledge systems—a 'bitter lesson' articulated by Richard Sutton (2019)[2].

This session attempts a critical reappraisal of the 'semantic vision' in archaeology, its current state and potential future. For this purpose, we invite contributions from two 'opposing camps': those who showcase why semantic approaches should shape the future practice and those who argue why traditional data structures continue (and perhaps should continue) to dominate data production and analysis. Contributions may focus on theoretical or practical aspects, on merits or shortcomings of both ‚camps', or any mixture thereof.

In this way, the session will address a number of key questions and issues, including:

- Why are the promises of semantic data so important to archaeologists, and which of them, have been fulfilled so far?
- How accessible and maintainable are semantic approaches in practice?
- When is the cost of semantic data modelling justified by demonstrable gains?
- How does everyday field work and data collection (capture?) need to change to accommodate, incorporate, or be driven by semantic approaches?
- Is the semantic paradigm outdated in the age of AI? Do we need a specific machine-language, if the machines now understand our language?
- What are the reasons for the success and longevity of non-semantic approaches?
- What are the reasons for the success and lasting popularity of semantic approaches?
- What core strengths of non-semantic data might be threatened if semantic approaches become prevalent?
- Are there visions for complementary roles or hybrid workflows between statistical/ML methods and explicit knowledge representation: Do efficient ways exist to reconcile semantic approaches with conventional data structures without adding redundant workload?

As the title suggests, the session has been designed to be adversarial in nature, based on the assumption that 'you cannot have your cake and eat it, too': given the high investment in different skills and infrastructures necessary to make use of both approaches and their radically different nature, a parallel approach with redundant data collecting and provisioning practices in both semantic and traditional data models seems not feasible. Or could we envision a way to reconcile the differences without creating inefficient redundancies and thus, have our cake and eat it, after all?

With this in mind, the session is intended to provide a forum for robust yet fair arguments and a lively debate, grounded in the realities of limited funding, (un)realistic demands made of archaeologists' skill sets, and the need for clear and practical research directives in the (next) coming age of austerity in academia. To ensure a rich and representative debate, we explicitly encourage contributions from early-career scholars, colleagues from geographically and institutionally under-represented regions, and researchers working outside of traditional academic networks. Our goal is to provide the space for constructive discussions among a

diverse group of people and perspectives, reflecting the wide spectrum of archaeological research and researchers.

Other Format Description

We wish to include lectures and debate: Our vision would be two have two “adversarial lectures” based on actual project experience followed by a debate slot of ca. 10-15 minutes. This way we can discuss the pros and cons as evident from the experience of researchers at all career stages and from varied institutional and geographical backgrounds and from project results as well as everyday archaeological practice. It is important for the concept of this session to be able to integrate contrary perspectives and thus identify common ground or irreconcilable differences via these debate slots.

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S31: Computational Archaeology Revisited: Building Bridges with Mathematics and Computer Science

Session Organisers:

Eythan Levy, University of Zurich

Martin Hinz, Kiel University

Session Format: Other

Description

The official mission statement of CAA states:

"Computer Applications and Quantitative Methods in Archaeology (CAA) is an international organization *bringing together archaeologists, mathematicians, and computer scientists*. Its mission is to encourage and facilitate dialogue between these disciplines, to provide an overview of the present state of the discipline, and to stimulate discussion to progress the field." (emphasis ours)

Yet, in practice, mathematicians and computer scientists are still under-represented, and most contributions come from archaeologists as end-users rather than as co-developers of new methods. In the early days of computational archaeology, cross-disciplinary collaboration was more common. Especially in the seventies, the pioneering work of the 1970 Anglo-Romanian Conference on Mathematics in the Archaeological and Historical Sciences conference (Hodson, Kendall and Tautu 1971) brought together a whole array of mathematicians

proposing concrete mathematical and computational solutions to archaeological problems. This period also saw the publication of the seminal work of Doran and Hodson on Mathematics and Computers in Archaeology (1975), which embodied the state-of-the art of computational/quantitative archaeology of the time — producing techniques such as seriation algorithms that remain influential today.

Since then, there have been notable breakthroughs, such as Bayesian approaches to radiocarbon dating (Buck et al. 1991; Bronk Ramsey 2009), the application of spatial point process models to settlement patterns, and the adaptation of phylogenetic and network-theoretical methods to study cultural transmission. Yet overall, the field has leaned more towards ready-made tools (GIS, network analysis, semantic modelling, AI applications) than to the joint development of novel mathematical or algorithmic frameworks.

This session aims to reinvigorate that dialogue. Our vision is a CAA that not only showcases applications but also nurtures collaborations where new mathematical models and computational techniques are developed for and with archaeology.

The intended round table would feature the following parts:

1. General introduction and problem statement (Levy and Hinz).
2. Short interventions by mathematicians, computer scientists, and archaeologists. Mathematicians and computer scientists would present techniques of their choice, which they feel might be of use for archaeology. The intention is, for the archaeological community, to discover techniques they might not be aware of, and which might have significant impact on future quantitative archaeological research. Archaeologists are also invited to present open problem statements: concrete case studies for which they failed to find practical quantitative or algorithmic solutions among the standard toolkits. Each intervention would consist of a short presentation, followed by a longer discussion with the audience.
3. Brainstorming part. General discussion, hoping to find convergences between the exposed archaeological needs and available computational techniques presented.

We invite colleagues from all three disciplines to participate actively, especially in presenting open problems or potential solutions. Colleagues wishing to present either a mathematical/computational technique of their choice, or an open problem, are invited to submit an abstract to the session via the conference's standard abstract submission system.

Eythan Levy (eythan.levy@uzh.ch)

Martin Hinz (martin.hinz@unibe.ch)

Other Format Description

The intended round table would feature the following parts:

1. General introduction and problem statement (Levy and Hinz).

2. Short interventions by mathematicians, computer scientists, and archaeologists. Mathematicians and computer scientists would present techniques of their choice, which they feel might be of use for archaeology. The intention is, for the archaeological community, to discover techniques they might not be aware of, and which might have significant impact on future quantitative archaeological research. Archaeologists are also invited to present open problem statements: concrete case studies for which they failed to find practical quantitative or algorithmic solutions among the standard toolkits. Each intervention would consist of a short presentation, followed by a longer discussion with the audience.

Brainstorming part.

3.General discussion, hoping to find convergences between the exposed archaeological needs and available computational techniques presented.

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S32: Replay: Computational Heritage of Games

Session Organisers:

Summer Courts, University of Reading (chair)
Barbara Care, University of Lausanne (chair)
Walter Crist III, Leiden University (chair)
Tim Penn, University of Reading (chair)
Branislav Kovar, Slovak Academy of Science
Dorina Moullou, Hellenic Ministry of Culture / Hellenic Open University

Session Format: Standard

Description

Computational approaches are transforming the way we understand and preserve cultural heritage. One emerging—and presently underexplored—area is the application of Artificial Intelligence (AI) and other computational methods to traditional games. Traditional games—particularly board games—offer a unique window into the past, reflecting social norms, values, and behaviours that are at risk of being lost due to their intangible nature. The rules, playing contexts, and embodied practices often remain undocumented or only partially preserved.

Though existing studies (Crist et al. 2024; Browne 2023; Donkers et al. 2000) have made strong opening moves, the field is still in its early game. Much of the board remains unexplored, with significant potential for computational methods to advance our understanding). This session—organized by the COST Action (CA22145) Computational Techniques for Tabletop Games Heritage ("GameTable")—aims to expand on the themes of our upcoming special issue in JOCCH (*Journal on Computing and Cultural Heritage*). This session will explore the reconstruction and preservation of traditional games, viewing them not merely as leisure activities but as rich cultural artifacts and historical narratives that are vital for a deeper understanding of human societies. By integrating perspectives from archaeology, artificial intelligence, and cultural studies, this session will allow us to **"**replay**"** the past and begin writing the playbook for how computational methods can help illuminate the playability, strategies, and social functions of traditional board games.

Topics for Discussion:

This session invites papers and presentations addressing a broad range of themes related to computational approaches to games heritage, including but not limited to:

Computational reconstruction of traditional games: Using methods such as procedural content generation, human-in-the-loop AI, and human-like AI to infer or rebuild game mechanics and rule sets.

Machine learning for game identification: Applying techniques such as text mining or gameplay metric analysis to identify, classify, or interpret tradi**t**ional games.

Simulating traditional games: Developing digital implementations and/or tailored, explainable AI agents to simulate how games may have been played.

Analysis of digitised traditional games: Exploring gameplay data and strategy detection to better understand player behaviour and game design.

Mathematical and statistical modelling: Creating formal models of gameplay, game balance, or player strategies based on historical data.

Computer vision applications: Applying image analysis to recognize, reconstruct, or interpret physical components of games from archaeological or archival materials.

3D modelling of game artifacts: Generating accurate digital representations of historical gaming objects for research, preservation, or display.

Educational and heritage engagement: Exploring how reconstructed games can support education, public engagement, or digital storytelling in heritage contexts.

Digital documentation of gaming materials: Using computational tools to support the archaeological recording and interpretation of game-related artifacts.

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S33: Generative AI, Text Mining, and Semantic Modelling: Using Big Models for Big Problems, FAIRly!

Session Organisers:

Alphaeus Lien-Talks, Historic Royal Palaces

Florian Thiery, Leibniz-Zentrum für Archäologie (LEIZA), Mainz, Germany & Research Squirrel Engineers Network

Session Format: Standard (talks + closing discussion)

Presentations can be about the following, rather than answering all aspects.

Description

AI and ML are transforming archaeological research and heritage data work. This session highlights practical approaches for leveraging Generative AI, text mining [1], and semantic modelling/reasoning (e.g., CIDOC CRM/CRMarchaeo, RDF/LOD, SKOS thesauri, Wikidata) [2] to ensure that extraction, linking, validation, semantic reasoning, and reuse are schema-aware, explainable, and FAIR [3&4]. We want to highlight pipelines where knowledge graphs guide and constrain AI, and where semantic reasoning (rules, constraints, and logical inference) improves accuracy, transparency, and downstream interoperability [3,5]. This

session aims for standard talks (research papers) and Lightning Talks (small on-going projects, scripts like little minions, etc.); please indicate what you want to present.

We particularly welcome papers from early researchers or from underrepresented communities.

Rationale and Scope

AI and ML, especially Large Language Models and semantic reasoning, are rapidly reshaping archaeological research and heritage data work. Beyond the hype, we need evidence on when these systems help, when they harm, and how to make their outputs reusable and trustworthy. This session brings together:

- **Generative AI & Text Mining** (LLMs, IR, NER, OCR pipelines, prompt design, non-determinism), including graph-backed retrieval to ground prompts [1,6];
- **Semantic Modelling/Reasoning** (ontologies, knowledge graphs, entity linking, ontology alignment, SHACL validation) [2,3,5]; and
- **FAIR Using AI** (automated metadata extraction, FAIRification workflows, provenance, licensing, stewardship, reproducibility) [1,4].

Contributions should show how semantic models plug into AI methods end-to-end, e.g., graph-backed retrieval for prompts, ontology-aware IE, constraint-based post-processing, and inference over time/space, to deliver robust, reusable results [5&6].

Topics of Interest (include but are not limited to)

- GenAI for text generation, coding assistance, summarisation, translation, and data wrangling in archaeology.
- Information extraction from grey literature, reports, registers, and multimedia; OCR post-processing and layout-aware parsing.
- Semantic modelling & knowledge organisation: ontology design/extension (e.g., CIDOC CRM/CRMarchaeo), cross-walks, SKOS concept schemes and thesauri (e.g., AAT, FISH, PeriodO), knowledge graph construction; entity resolution across HERs, museums, archives, and research datasets; **semantic reasoning approaches and constraint validation** [2,3,5].
- Graph-augmented AI: SPARQL/graph retrieval (RAG) feeding LLM prompts; ontology-aware IE using preferred/altLabels and multilingual synonyms; mapping and reconciliation to CRM properties/classes; linking to Wikidata [6].
- Validation and reasoning in the loop: **SHACL/SHEX for constraint checking and repair; OWL reasoning for consistency and entailment; rule-based reasoning** (SWRL/SHACL-Rules/SHACL-SPARQL) for temporal, spatial, and part-of relations; handling uncertainty and confidence propagation [5].
- FAIR with AI: automated metadata capture; FAIR assessments; PIDs; packaging and documentation; model cards and data cards for archaeological AI [1,4].

What We Ask from Contributors

- Transparent evaluation (report datasets, baselines, confidence/uncertainty, and error analysis):
    - IE/NER/classification: precision/recall/F1.
    - IR: top-k, nDCG.
    - Entity linking: accuracy/F1, ambiguity cases.
    - Ontology alignment: precision/recall/F1 on correspondences, mapping coverage, error types.
    - Reasoning/validation: consistency checks (pre/post), SHACL coverage (% shapes satisfied) and violation rates; competency questions via SPARQL (pass rate); entailment precision/recall on gold inference sets.
    - FAIR: metadata completeness, PID coverage, provenance depth, reproducibility score.
- Reproducibility: share code/models/data where possible. If restricted, provide synthetic examples or detailed protocols; include brief model/data cards and note energy/compute used.
- Pipeline clarity: include a diagram and artefacts (e.g., SHACL shapes, mapping tables, prompt templates, SPARQL queries, and reconciliation rules).

Intended Outcomes

- A shared view on when and how AI truly adds value in archaeology.
- Practical checklists for FAIR-by-design workflows (ingestion → triplification → IE/linking → KG-RAG → reasoning/validation → publication) [4-6].
- A starter kit: example **SHACL** shapes, CRM mapping stubs, KG-aware prompt templates, and SPARQL test suites (competency questions) [3,5&6].
- Connections across research, sector bodies, and data services to advance interoperable, ethical, and maintainable solutions.
- Ideas on how semantic reasoning creates new knowledge from unstructured and/or semantically modelled data.

Accessibility & Ethics

We encourage accessible presentation materials, plain-language summaries, and disclosures on data sensitivity, cultural considerations, and potential harms. Work with restricted data should outline mitigation strategies (e.g., redaction, differential access). Please state open vs closed-world assumptions and how constraints affect the inclusion/exclusion of sensitive entities [4&5].

Special Interest Group

This session is jointly organised by the CAA SIG on Artificial Intelligence and the SIG Data Dragon on Semantics and LO(U)D in Archaeology. The core aim of the SIGs is to utilise the SIG format to raise awareness of AI and Linked Open (Usable) Data in archaeology.

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S34: Modelling Seafaring: Methodological Retrospective and Future Roadmap

Session Organisers:
David Gal, University of Haifa
Karl Smith, University of Oxford

Session Format: Standard

Description

This session aims to focus on the methodological realm of modelling seafaring. It solicits the showcasing of modelling experiences, including choice considerations, modifications to existing models, tests conducted, and ideas for the future. The session aims to help identify and prioritise the elements of seafaring modelling and its application, contributing towards the goal of an emerging formalisation of such modelling in future research.

Modelling of historic seafaring is not a new undertaking, and it has become increasingly prevalent in the last decade, supporting maritime connectivity studies. The introduction of

methods to model seafaring has primarily been an unorchestrated effort of individual researchers or laboratories. (Perttola & Slayton, 2024, p. 2). Two separate paradigms have emerged in recent years. Most studies have employed GIS cost surface analysis, which is drawn from terrestrial movement modelling tools, with adaptations to maritime modelling. (Alberti, 2018; Leidwanger, 2013; McLean & Rubio-Campillo, 2022; Safadi & Sturt, 2019; Trapero Fernández & Aragón, 2022). Others have drawn methods from the nautical sphere, such as weather-routing software packages. (Gal et al., 2021; Warnking, 2016). The GIS cost surface analysis tools have been pushed to new limits, including batching sequential simulations, to overcome the limitation of static averaged wind data. (Perttola, 2021; Perttola & Slayton, 2024). However, they are not without significant drawbacks, such as the inability to incorporate waves, sea currents, and the human factor in modelling.

The validity of using averaged wind data has been questioned; yet many recent studies remain reluctant to abandon this paradigm. The leading presumption for the use of averaged environment is that it reflects the average of all sailings. (Scheidel et al., 2012), while the presumption of the input of a large sample of wind at high temporal resolutions is that it maintains knowledge of the variability of the winds, and that these constitute the windows of favourable winds, which are key for Mediterranean sailing mobility. Multiple simulation runs on a large sample of non-averaged environmental data facilitate a statistical spread of output measures.

Mariners would pick and choose when conditions suited departure on a sailing passage with favourable winds, and they would be prudent in avoiding severe weather conditions. Such reasoning needs to be implemented in seafaring modelling. The human factor may be introduced to the simulation process through agent-based modelling (Davies & Bickler, 2013; Smith, 2020), or it may be reflected in the classification of simulation output using specific criteria. A question that needs to be debated is whether the modelling should focus on practical mobility (i.e., including the human factor) or whether the potential envelope of maritime mobility can be based solely on modelling the technological capabilities of the vessels.

The topic of model verification is an area where solutions are needed, with the hope of finding a standard benchmark that all modellers can use. The practice of benchmarking against historic textual evidence often lacks the knowledge of whether the reported duration was average or if it might have been a faster or slower passage. In many cases, even the season is unknown.

The topic of model output and units of measure deserves a degree of formalisation in support of sharing data and supporting downstream processes. The output of sailing duration as the single cost measure is limited in representing sailing mobility. Time spent waiting for favourable winds was common, and it is an additional cost factor. The need for a temporal dimension (monthly or seasonal) is worthy of debate.

A more detailed discussion on the methodologies of maritime movement models' inputs, processes, and outputs is presented by Slayton et al. (2025), and it is recommended reading in preparation for this session.

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S36: Composed for Success: Making the Most of Chemical Data in Archaeometry

Session Organisers:

Michaela Schauer, Vienna Institute for Archaeological Science (VIAS) of the University of Venna & Natural History Museum Vienna (NHMV)

Michelle Richards, School of Geography, Earth and Atmospheric Sciences, University of Melbourne

Brandon L. Drake, Department of Anthropology, University of New Mexico

Session Format: Standard

Description

Archaeological data from XRF, LIBS, ICP-MS, FTIR, and Raman spectroscopy is rapidly increasing as these techniques become more accessible, affordable and portable. However, compared to laboratory instruments, portable non-destructive assays, critical assumptions

which underlay quantification and interpretation differ. As archaeologists gather massive amounts of compositional and spectral data from materials like pottery, metals, soils, pigments, and glass, this abundance of data for analysis brings both opportunities and challenges. We discuss how to make this data meaningful, reproducible, and interoperable outside of laboratory contexts.

This session, organized by the Global pXRF Network (GopXRF.Net), invites contributions that explore the methodological, computational, and ethical frontiers of analytical data in chemical analysis in archaeometry. We welcome papers addressing workflows from data collection to interpretation, particularly those that integrate **automation, machine learning, AI-based classification**, or **semantic modeling**.

Our goal is to foster an open conversation on the future of chemical data in archaeological context that moves beyond the instrument—toward frameworks that are **computationally robust**, **ethically grounded**, and **collaboratively reproducible**.

Key themes for the session include:

1. AI and Machine Learning

- Applications of supervised and unsupervised learning to characterize materials, detect anomalies, or predict provenance.
- Use of spectral fingerprinting and pattern recognition.

2. Automated Calibration and Standardisation

- Inter-lab comparability and reproducibility.
- Advances in data and error handling.
- Development of open-source tools and calibration repositories.

3. Data Management, Semantics, and FAIR & CARE Principles

- Structuring compositional data for long-term accessibility and reuse in data repositories in perpetuity.
- Ontologies and metadata standards for chemical data.
- First Nations Data sovereignty
- Critical perspectives on algorithmic bias and over-interpretation.

4. Case Studies

- How integrated data approaches enhance understanding of technology, exchange, and provenance.
- Studies illustrating the full workflow from field collection to digital publication.

Audience and Impact:

This session is aimed at a diverse audience - archaeologists, archaeometrists, data scientists, and heritage professionals - who engage with chemical analysis, data modeling, or AI in

archaeology. We hope to bridge gaps between field practitioners and computational modelers by showcasing both grounded case studies and conceptual frameworks.

Expected Outcomes:

- Foster cross-disciplinary dialogue and community building.
- Identify bottlenecks in analytical workflows and share open solutions.
- Promote reproducible, ethical, and AI-ready data practices in archaeometry.
- Inspire collaboration through GopXRF.Net and related networks.

Future perspectives:

We also envision follow-up discussions (virtual or in-person) or the possibility of an open-access proceedings volume or workshop post-conference. The session will be structured to encourage dialogue, including a closing panel discussion.

S37: Future Sight on Past Landscapes: Vision Foundation Models for Archeological Remote Sensing and Landscape Archaeology

Session Organisers:
Sohini Mallick, Independent Researcher
Jürgen Landauer, Landauer AI Research
Agnes Schneider, Leiden University

Session Format: Standard

Description

For the last few decades, advances in artificial intelligence, particularly deep learning and computer vision have enabled new paradigms in the advancement of archaeological remote sensing and landscape archaeology. Recent advances in Vision Foundation Models (VFMs), including ChatGPT, Gemini, SAM, DINOv3, OWL-ViT, Grounding DINO and geospatial-

specialized models like Prithvi, AlphaEarth and DeepAndes, are reshaping how we detect and interpret archaeological features from satellite, UAV, and LiDAR. Their ability to generalize across imagery types and perform *zero-shot* or *few-shot detection and segmentation* offers new opportunities for landscape archaeology and archaeological remote sensing, where annotated datasets remain scarce.

Building on recent work in archaeology (Abate et al., 2023; Ciccone, 2024; Landauer & Klassen, 2025) and remote sensing AI (Huo et al., 2025; Guo et al., 2025), this session invites applied and critical contributions that assess the potential of VFMs for archaeological feature detection, practical workflows and adaptations, reproducible pipelines, and shared resources. We also welcome reflections on key technical and ethical challenges, including false positives, interpretability, cultural sensitivity, and the risks of automated misrepresentation or misuse, as we collectively explore the role of vision AI in advancing scalable, robust, and responsible archaeological research.

Topics of Interest include but are not limited to:

- *Model Application & Evaluation*

We are looking *for* case studies of using VFMs for detecting archaeological features in satellite, UAV, or LiDAR data. Topics include comparative evaluations of general-purpose and geospatial models, prompt engineering, tiling strategies, terrain classification, anomaly detection, and clustering.

- *Deployment & Field Integration*

We are interested in the integration of VFMs into field workflows through drones, edge devices (e.g., Jetson), and mobile platforms. Especially real-time detection, vision-assisted mapping, and energy-efficient or offline deployments in remote areas Visual Perception Engine

- *Benchmarks, Reproducibility & Tools*

We would like to focus especially on the development of modular pipelines, open-source tools, and well-documented workflows. We are hoping for contributions which address FAIR data practices, benchmark design, annotation formats, and archaeology-specific evaluation metrics such as IoU or false positive rates.

- *Critical Perspectives & Position Papers*

Taking a step forward, we specifically encourage conceptual and technical reflections on adapting Vision Foundation Models for archaeology. Amongst others topics such as the feasibility and value of domain-specific pretraining (e.g., an “ArchaeoVFM”), handling model failure modes such as false positives and hallucinations, and challenges in interpretability for heritage-specific outputs are of interest. Theoretical contributions that explore the epistemological implications of relying on foundation models in archaeological remote sensing and landscape archaeology are strongly welcomed.

- *Community & Collaboration*

On a broader scale, initiatives focused on shared infrastructure, participatory annotation, and interdisciplinary research are very welcome, including open benchmarks, collaborative tools, and frameworks that promote reproducibility and community engagement.

- *Ethical Implications of using Vision Foundation Models in Archaeology*

Lastly but of course not least at all, we are looking for papers which focus on the cultural and ethical responsibilities involved in the application of VFMs to archaeological data. We consider this as an umbrella for the risks of enabling looting,unauthorized site exposure, applying models without contextual knowledge, and/or reinforcing geographic and cultural bias. We encourage contributions which address how to communicate model limitations, uncertainty, and confidence in ways that are transparent and respectful of heritage contexts.

To support transparency and reproducibility, we ask contributors to:

- Report evaluation metrics clearly (e.g., precision, recall, IoU, false positive rates)
- Document datasets, preprocessing, and annotation workflows
- Disclose compute infrastructure (e.g., GPU specs, inference/runtime details)
- Communicate uncertainty and model limitations responsibly
- Include pipeline diagrams or summaries when applicable

Presentation Submission Formats

We welcome **standard talks** of 15 minutes and **lightning talks** of 5 to 10 minutes, highlighting a specific topic, idea or case study. Please indicate your preferred presentation format when submitting.

We **especially encourage** submissions from **early-career researchers and students.**

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S38: End-to-End Reusable Archaeological Data Workflows: Spotlight on the Demonstrator Model

Session Organisers:

Emilie Page-Perron, Archaeology Data Service / ARIADNE
Marco Callieri, National Research Council of Italy / ARIADNE
Julian Richards, Archaeology Data Service / ARIADNE

Session Format: Standard

Description

The FAIR principles have become one of the primary objectives in data production for archaeological projects: being able to produce data that serves more than the project's immediate purpose, long after the project's completion, has proven their importance in the field. However, achieving FAIR status for a single project's data cannot be the end. Even if the

result of some spot actions fulfils the four FAIR principles, too often the project effort, in terms of methodology and workflow, remains an isolated process, non-replicable and too cumbersome.

Providing access to individual datasets and tools in isolation from each other is insufficient, and sustainable and standardised workflows, relying on dedicated tools and infrastructures, can address this issue, facilitating the establishment of a **FAIR-by-design** strategy for research projects. Researchers should be able to shape a project's data flow and management from the very beginning of a project, using these workflows, ensuring the data aspect of their results is FAIR without the need for custom, cumbersome one-shot solutions.

Such workflows are now being developed, albeit not systematically. As the field builds knowledge around the development and maintenance of sustainable research workflows, we have learned that the ideal scenario includes the elaboration of **demonstrators**, an essential component of FAIR research workflows. In this, communities play a key role; the technologies are available, but people are essential to ensure their take up. Our session therefore addresses the CAA2026 conference theme head-on.

Research infrastructures provide important pillars of the community landscape. Advancing FronTier Research In the Arts and hUManities (ATRIUM, https://atrium-research.eu/) is a four-year European project that connects the digital infrastructures ARIADNE, DARIAH, CLARIN, and OPERAS, highlighting the composability of services to provide concrete solutions for both data management and workflow reusability challenges in Archaeology. Its thirty constituent partners endeavour, among other objectives, to prepare research workflows and associated demonstrators for the major usual computational research tasks on text, image, 3D, sound, and geographic data in the domain of Archaeology, and to make these available to the wider community via the SSHOC Open Marketplace. Demonstrators are real-world examples of workflow implementations, key to showing how research workflows can be reused and adapted to different project contexts, providing the means to render data really FAIR.

This session is co-organised by The Archaeology Data Service (https://archaeologydataservice.ac.uk/) and the research infrastructure ARIADNE (https://www.ariadne-research-infrastructure.eu/), as part of the ATRIUM project. The goal of the session is to showcase this demonstrator model, exploring the current status and trends of FAIR workflows, tools, and infrastructures. By showcasing existing demonstrators of such research workflows and comparing the outcomes of case studies, this session aims to foster dialogue & best practices, and reflect on issues and facilitators for sustainable data reuse.

We invite papers from ATRIUM partners and beyond to share applications in practical case studies of FAIR workflows, especially in the context of data reuse.

Topics can encompass:

- Strategies and tools for reusing legacy datasets
- Adoption of ATRIUM & ARIADNE tools, or other tools facilitating research workflows and their demonstrators
- Impact & sustainability of FAIR workflow demonstrators
- Metadata enrichment and its applications in FAIRification
- Other related topics

We encourage individuals from diverse professional backgrounds and outside Europe to submit.

S39: Palaeo-GIS

Session Organisers:

Patrick Cuthbertson, The Central Asian Archaeological Landscapes (CAAL) Project, UCL; Centre for the Archaeology of Human Origins (CAHO), University of Southampton

Christian Sommer, Heidelberg Academy of Sciences and Humanities Research center "The Role of Culture in Early Expansions of Humans" (ROCEEH) at the Senckenberg Institute and the University of Tübingen

Peny Tsakanikou, The University of Crete Research Center (UCRS), Department of History and Archaeology, University of Crete, Gallos Campus, 74150 Rethymno

Session Format: Standard

Description

In the first Palaeo-GIS session (CAA Tübingen, 2018) we contended that Palaeolithic and prehistoric applications of GIS are fundamentally different from applications in later periods, and advocated for particular consideration of their unique analytical challenges and 'temptations' (Cuthbertson & Tsakanikou 2023).

The aim of our second Palaeo-GIS session is to further develop this theme in discussion with GIS users facing similar issues in Palaeolithic and later prehistoric research contexts.

The study of human prehistory requires an holistic approach to properly assay the complex interplay of palaeoenvionmental factors, resources (affordances), material culture, and early human behaviour across vast spatio-temporal scales.

Although Geographic Information Systems (GIS) have proven an effective analytical tool for integrating and analysing these different factors and their interrelationships, a unique theoretical basis for their application is still underdeveloped.

Palaeolithic applications of GIS can be used to:

• Address prehistoric research themes at different spatial scales, from analysis of individual artefacts, the more familiar scale of the site, and over increasingly vast regions and landscapes to the continental level.

• Tackle broad, continental-scale prehistoric narratives, and even provide finer-scale empirical and analytical connection for broader scale narratives.

• Integrate time-depth through the capabilities of temporal GIS (or TGIS), to understand environmental and occupation change over time.

• Organise, analyse, and visualise archaeological and paleoenvironmental data from diverse sources; combining and compiling from diverse spatial datasets and generating novel data.
• Analyse the impact of enduring physical features on ancient human occupation, such as geomorphological, tectonic, and geological factors.

• Employ a vast array of tried and tested geospatial computational methods for data analysis, as well as including the tools to develop bespoke methods of analysis.

• The capability to generate and test predictive models, which is probably the most common current usage of GIS in Palaeolithic applications.

• The effective communication and dissemination of results through map making, georeferenced orthophotos, and other cartographic outputs.

• Make use of standardised and reusable filetypes and data schemes developed in other areas (e.g. Building Information Modelling (BIM)) for coordinated collaboration, sustainable data publication, and long-term preservation.

This potential of GIS applications in Palaeolithic and later prehistoric research has only very partially been explored, and there remains a lot of potential for innovative and bespoke solutions. The opportunity remains to develop new approaches that emerge from the needs

and logical structure of Palaeolithic research and the prehistoric record, rather than being driven primarily by technological or conceptual developments in other fields.

It is a combination of the analytical challenges and temptations of Palaeolithic applications of GIS that potentially hinder the ability of researchers to capitalise on this opportunity. Our identified challenges and temptations of Palaeolithic applications of GIS are:

Challenges
1. poor data coverage
2. vast spatio-temporal scale
3. the difficulty of inferring behavioural patterns under the conditions of problems 1. and 2.

Temptations
1. to follow the data coverage, rather than to try to generate data for difficult places and periods
2. to adapt questions to the logic of data structure, rather than rework data to suit questions
3. to do analyses that are familiar but irrelevant, rather than pioneer new methodological solutions
(Cuthbertson & Tsakanikou 2023: 14)

The Palaeo-GIS session is intended to encourage contributions from authors applying GIS in Palaeolithic or later prehistoric contexts and research topics. We particularly encourage authors to submit papers that reflect on the unique characteristics and challenges of their prehistoric research context, and engage reflectively with those challenges.

Reference

Cuthbertson, P and Tsakanikou, P. 2023 Challenges in Palaeolithic Spatial Archaeology: Two Eurasian Case Studies. In:. Human History and Digital Future : Proceedings of the 46th Annual Conference on Computer Applications and Quantitative Methods in Archaeology. 31 October 2023. Tübingen University Press. pp. 51–68. DOI: https://doi.org/10.15496/publikation-87765.

S40: Digital Archaeology for Heritage under Threat: Modelling Climate Hazards and Landscape Change

Session Organisers:

Emeri Farinetti, Landscape Archaeology - Archaeological Theory and Methods, RomaTre University - Dipartimento di Studi Umanistici

Miltiadis Polidorou, Lab of Digital Humanities and GeoInformatics ,Archaeological Research Unit (ARU), University of Cyprus

Fernando Moreno Navarro, RomaTre University - Dipartimento di Studi Umanistici

George P. Pavlidis, ILSP - Institute for Language and Speech Processing, ATHENA - Research and Innovation Centre in Information, Communication and Knowledge Technologies

Session Format: Standard

Description

Archaeological landscapes are shaped by the interplay between human activity and natural forces such as erosion, sedimentation, tectonic shifts, and climate-driven changes. Today, these same forces—accelerated by climate change—pose unprecedented risks to cultural heritage, from flooding and coastal erosion to extreme weather events and desertification. These dynamics not only threaten the material integrity of archaeological sites but also challenge how we document, interpret, and preserve the past for the future.

This session explores how digital tools and spatial geotechnologies can help monitor, model, and mitigate climate-related hazards in archaeological landscapes, while also enhancing our understanding of their long-term evolution. We welcome contributions that showcase innovative workflows, risk-assessment strategies, and predictive models at the intersection of geomorphology, archaeology, and heritage conservation.

Topics may include, but are not limited to:

- High-resolution digital terrain analysis for vulnerability assessment
- Remote sensing and change detection for hazard monitoring (e.g., LiDAR, photogrammetry, UAV surveys, geophysical prospection)
- Geoarchaeological case studies addressing climate-induced landscape transformations
- Simulation and predictive modeling of hazard scenarios and human–environment interactions
- Integration of hazard datasets into archaeological GIS and decision-support tools
- Digital Twins for real-time monitoring and adaptive heritage management
- GIS-based spatial modelling for cultural heritage risk mapping and resilience planning

We particularly encourage interdisciplinary approaches combining earth sciences, climate studies, and digital archaeology to develop proactive solutions for cultural heritage under threat. This session also aims to foreground the role of computational and spatial methods in climate change adaptation strategies, ensuring that archaeological data informs policy and resilience planning.

Join us to advance the discussion on how digital archaeology can be a key player in safeguarding cultural heritage from climate change, bridging the gap between research, technology, and heritage protection.

S42: The Reuse of Digital Archaeological Archives and Data: Pathway to New Knowledge or Dead End?

Session Organisers:
Christophe Tuffery, Ministère de la Culture et UMR 8068 TEMPS
Sebastien Plutniak, CNRS
Marie Stahl, École Française d'Athènes
Stephanie Delaguette, CNRS

Session Format: Standard

Description

The amount of archaeological data published or archived in digital formats is increasing. In the context of the open science movement, disciplinary repositories (e.g. ADS, tDAR, OpenContext), journals (e.g. the *J. of Open Archaeological Data*), and specialized archive services contribute to this trend.

The FAIR principles are enthusiastically claimed as a guide in this way, and tireless efforts are made to make digital data findable and accessible - sometimes interoperable - and reusable.

But, are FAIR-compliant "reusable" data actually reused? In recent years, data reuse has become a concern, as reflected by conference sessions [1], publications [2, 3], standards [4], and collective projects [5]. Indeed, it raises controversial and sensitive matters:

- The scientific "publish or perish" rationale and archiving rationale "preserve or perish" can prove antagonistic. To what extent have studies based on data reuse actually demonstrated significant benefits in knowledge or methods to ground the idea that digital data conservation is worth it?

- The funding and support of open-science initiatives is made on the promise of their usefulness through reuse. This goes against the fact that professional norms in archaeology today still firmly promote the production of *new* data. What if data openly published is not reused? How to define and track reuse?

- When digital data is reused, how is it done? The reuse of openly published data can conflict with requirements in data sovereignty. How and to which extent are the CARE principles considered when it comes to digital archaeological data?

This session is intended to address these problems and other related issues. We welcome presentations about design studies grounded on data reuse, applied methods, results obtained, difficulties encountered and how they have been overcome, as well as data reuse policies, digital infrastructures, and monitoring.

Presentations should reflect a diversity of projects and actors, particularly those who are not members of academic and research communities (indigenous voices and practitioners) and who come from a variety of regions, especially those that are often underrepresented.

Presentations should also illustrate good practices, some of which could be used to define guidelines for encouraging and ensuring proper reuse of archaeological archives.

References

1. EAA 2024. Session “Old Excavations and Finds, New Data and Interpretations: The Use of Archives in Current Archaeological Research Projects”. DOI: https://doi.org/10.58079/vovk
2. Gupta, N. et al. 2023. “The CARE principles and the reuse, sharing, and curation of indigenous data in Canadian archaeology.” *Advances in Archaeological Practice* 11 (1): 76-89. DOI: https://doi.org/10.1017/aap.2022.33
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4. Marwick, B & S. E. Pilaar Birch. 2018. "A standard for the scholarly citation of archaeological data as an incentive to data sharing” *Advances in Archaeological Practice* 6(2): 125-143. DOI: https://doi.org/10.1017/aap.2018.3
5. Project TETRARCHs Telling Stories with Archaeological Data. https://www.tetrarchs.org

S43: Digital Evolution in Archaeological Practice: From Innovation to Infrastructure and FAIR data

Session Organisers:

Chiara G. M. Girotto, Freelance Archaeologist & Osteologist
Daniel Löwenborg, Uppsala University
Albrecht M. F. Knauber, Arch Pro Beratungsgesellsch. mbH
Stephan Winkler, illisystems

Session Format: Standard

Description

Following recent explorations of the implementation of standards, FAIR data recording, and emergent standards, as well as their intersection with commercial archaeology and academic research, this session examines the development lifecycle of digital archaeological data and solutions—from experimental tools to essential infrastructure. We wish to investigate how innovations become integrated into archaeological practice and what this evolution reveals about the discipline's digital future.

Commercial archaeology occupies a unique position where innovation must prove itself immediately practical. This session explores the development pathways of digital solutions, examining how tools evolve from addressing specific project needs to serving broader archaeological communities, and can navigate both formal organisational requirements and the needs of academic research. We invite papers that explore the critical transition points where individual solutions become shared resources, and local innovations gain international relevance.

The session addresses the increasingly blurred boundaries between commercial and academic data generation. As development-led archaeology produces ever-larger datasets structured according to FAIR principles, these resources become invaluable for synthetic research, regional studies, and heritage management. We examine how this convergence shapes development priorities and funding models for archaeological infrastructure. This becomes increasingly relevant as the EU Open Data Directive is implemented, and there will be growing pressure to make data from archaeological investigations openly accessible and FAIR. By building on solutions from the archaeological community, this can be an opportunity to transform archaeological practice.

Central to our discussion is the sustainability of digital innovation. Many successful solutions begin as cost-effective responses to immediate needs—custom scripts, adapted open-source tools, or lightweight databases. We explore how these pragmatic beginnings can evolve into robust, maintainable systems without losing their original flexibility and efficiency.

The human dimension remains paramount: how do development teams strike a balance between user needs and technical possibilities? How do we ensure that digital evolution enhances rather than constrains archaeological practice? What governance models best support community-driven development while ensuring long-term sustainability?

We invite contributions addressing:

- Development trajectories from prototype to production in archaeological software
- Governance models for community-driven digital infrastructure
- Bridging commercial innovation with academic research needs
- Sustainability strategies for archaeological digital tools and data
- The economics of open-source development in archaeology
- User-centered design in archaeological software development
- Case studies of successful tool evolution and adoption
- Challenges in scaling local solutions to international contexts

S44: Data are People: Data Making as Mirror of Past and Present Practice

Session Organisers:
Loes Opgenhaffen, University of York / Saxion University of Applied Sciences
Vasiliki Lagari, Belvedere Museum (Vienna) / International Hellenic University

Session Format: Standard

Description

Too often we hear at conferences and courses about the production and aggregation of data, but not about what precedes data: the people creating it (after d'Ignazio and Klein 2023, 7). We hear hardly anything about what this data means or about the subjectivity inherent in using tools to create something: the choices we make in the process of first deciding what is important to document (in 3D) and what is *not*, and secondly, the purpose of the visualisation based on predetermined commercial or scientific objectives (e.g. public outreach, academic publication, project documentation, etc.). These decisions determine both the tools and the resolution of the output, as well as the settings (camera, 3D scanner, etc.), all impacting the final visual result. This means that persons are just as involved in the production of 3D

visualizations as the devices they use, and they mutually affect and direct each other and the product. We understand this human-machine engagement as *sociality*.

This implies a social environment of data production: several people are involved, and even more people are involved in the consumption of this data. When we look beyond this anthropocentric perspective and extend sociality to the machine's capacity for action, a synergy arises between the operator and the device. This combination invites a continuous dialogue with our device, which informs our decisions. The limitations that our digital tools sometimes impose actually offer opportunities instead, and stimulate our *creativity* to find new solutions, adapting (i.e. improving) the devices we use, which are often not designed for archaeology.

The documentation of this synergy can be understood as paradata, emphasizing the social and creative dimensions of data-making. Awareness of the social aspects of production promotes creativity, but standardisation in the documentation of heuristic processes can simultaneously constrain it. The documentation of the creative process can be summarised as a pipeline. The pipeline should not be conceived as a rigid, step-by-step manual; rather, its paradata component provides the intellectual context and creative inspiration for engaging with the tools, which we might call the “machine factor.” The amalgamation of the unique character of heritage objects, volatile nature of technology and changing epistemelogies means that both experienced practitioners and novices are constantly faced with new challenges, for which paradata can foster adaptive and innovative solutions.

Although such pipelines cannot be replicated exactly, they offer a flexible framework to guide practice. In this way, paradata bridges two dynamic temporalities – the study of the past and contemporary practices – and offers future researchers a reflective lens on our own social, professional and intellectual worlds.

In this session, we invite researchers and practitioners to share their “creative” methodologies for producing 3D data and to explore whether there are opportunities for a standardised way of documenting our data visualisation processes, with an emphasis on the social aspects of the data creation process (Huvila 2025). By comparing technical pipelines and social practices in academic and development-led archaeology and the GLAM sector, this session aims to promote discussion about practitioners' experiences with technologies in order to find common ground at this specific social level of creating 3D visualisations. These sectors should not each reinvent the wheel separately, but share their expertise to improve registration processes while recognising the social nature of the production process of 3D visualisations of heritage. We are certainly not the first to pursue such a goal, but since there is still no form of shared and accepted standardisation (but there is certainly a need for it) for documenting and sharing practices such as workflows or protocols (Opgenhaffen et al 2021), this goal must continue to be pursued.

Papers may focus on either or both themes, but are not limited to the following topics, however, we advise to include/apply a reflexive approach by considering the social context they work in:

- Synergy between people and digital devices
- The social production of 3D visualizations of archaeological and heritage objects
- Methodologies of making 3D objects

- Documentation schemes for recording paradata
- Standardization of recording production/creative processes

Suggested reading:

Huvila, Isto, Lisa Andersson, and Olle Sköld, eds. *Perspectives on Paradata: Research and Practice of Documenting Process Knowledge*. Knowledge Management and Organizational Learning, vol. 13. Cham: Springer, 2024. https://doi.org/10.1007/978-3-031-53946-6

Ioannides, Marinos, Drew Baker, Athos Agapiou, and Petros Siegkas, eds. *3D Research Challenges in Cultural Heritage V: Paradata, Metadata and Data in Digitisation*. Lecture Notes in Computer Science, vol. 15190. Cham: Springer, 2025. https://doi.org/10.1007/978-3-031-78590-0

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Opgenhaffen, Loes, Hayley Mickleburgh, Martina Revello Lami (2021). "Art, Creativity and Automation. From Charters to Shared 3D Visualization Practices." *Open Archaeology* 7(1), 1648-1659. https://doi.org/10.1515/opar-2020-016

S45: Computational Archaeology at Scale: Large Spatial Datasets for Unveiling Cultural Landscapes

Session Organisers:
Jonathan Lim, University of Arkansas
Carla Klehm, University of Arkansas
Jack Berner, Washington University in St Louis

Session Format: Standard

Description

As spatial technologies advance rapidly in sophistication and become more accessible, archaeologists increasingly wield large datasets to answer landscape-scale research questions. Emerging technologies like light detection and ranging (LiDAR), passive and active satellite sensors, unmanned aerial systems-mounted cameras, structure-from-motion (SFM) elevation data, large-scale geophysical survey, and others are broadly known as high density survey and measurement (HDSM) (Opitz and Limp, 2015; Klehm et al., 2019). The data-rich nature of

these datasets multiply the options for analysis, often generating unexpected insights and novel research directions.

For example, airborne LiDAR survey, once exclusively the purview of only the most well-funded projects, are now relatively more accessible by mounting them on UAS units (Risbøl and Gustavsen, 2018), enabling feature visualization and heritage management/monitoring over vast swathes of densely vegetated terrain (Frachetti et al., 2024; Vinci et al., 2025). Open science archival practices further improves access to these elevation datasets, enabling large-scale analysis at minimal cost. Satellites now have near-total coverage of much of the world at very high resolution— beyond direct observation of archaeological sites and the environment, it is possible to produce elevation models of the landscape and even small archaeological features (Lim and Linares Matás, 2023). In order to efficiently study these large HDSM datasets, many archaeologists have turned to machine learning (Bellat et al., 2025). This field has advanced substantially in recent years and has yielded impressive results, although it is often challenging to identify best practices for specific environment types and cultural contexts.

In this session, we invite researchers to showcase how they have used HDSM datasets in innovative ways. By no means a comprehensive list, topics may include or be tangentially related to the following:

- Large UAS or terrestrial LiDAR surveys, and the challenges of storing and processing such data.
- Satellite remote sensing using passive (Visible light or multispectral) or active (e.g., Synthetic aperture radar) sensors, for direct observation or surface reconstruction.
- Historical imagery, especially imagery that inherently involve complex issues (e.g., Keyhole) in their processing and applications
- Low-cost and open methods for visualizing, processing, and archiving HDSM
- Machine learning for automatic classification or computing change in longitudinal datasets
- Landscape-scale geophysical survey, both vehicle-mounted and pedestrian
- Cloud-based processing workflows for HDSM data in a lab or field environment
- Data fusion of different types of spatial data

References

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Frachetti, M.D., Berner, J., Liu, X., Henry, E.R., Maksudov, F., Ju, T., 2024. Large-scale medieval urbanism traced by UAV–lidar in highland Central Asia. Nature 634, 1118–1124. https://doi.org/10.1038/s41586-024-08086-5

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multispectral satellite imagery to conceptualize ancient landscapes. J. Anthropol. Archaeol. 54, 68–83. https://doi.org/10.1016/j.jaa.2019.02.002

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Opitz, R., Limp, W.F., 2015. Recent Developments in High-Density Survey and Measurement (HDSM) for Archaeology: Implications for Practice and Theory. Annu. Rev. Anthropol. 44, 347–364. https://doi.org/10.1146/annurev-anthro-102214-013845

Risbøl, O., Gustavsen, L., 2018. LiDAR from drones employed for mapping archaeology – Potential, benefits and challenges. Archaeol. Prospect. 25, 329–338. https://doi.org/10.1002/arp.1712

Vinci, G., Vanzani, F., Fontana, A., Campana, S., 2025. LiDAR Applications in Archaeology: A Systematic Review. Archaeol. Prospect. 32, 81–101. https://doi.org/10.1002/arp.1931

S46: The Human Factors in Archaeological Data Recording

Session Organisers:
Silvia Götti, Universität Bern
Piotr Wroniecki, Montefortino Prospection & Digitalisation

Session Format: Other

Description

New technologies and digital tools promise precision yet archaeological data are still shaped by human choices and limitations. This session focuses on how factors such as expertise, stress, improvisation, or recording bias influence the creation and use of digital archaeological records.
We encourage case studies and reflections that show not only where things go wrong, but also how we can design better practices. What lessons can we draw from common mistakes? How can systems be built to reduce human error without ignoring the creativity and flexibility that fieldwork demands? By comparing experiences, we aim to outline practical

guidelines for improving data quality in archaeological recording and processing.

Possible topics for presentations include, but are not limited to:

- sources of recording bias and missed opportunities
- improvisation in the field and its consequences
- reorganizing and migrating “grown” or legacy data systems
- creative adaptation or misuse of digital tools not designed for archaeology
- breaking (and fixing) our digital tools in practice
- strategies for designing data systems that reduce human input errors

This session is aimed at archaeologists, computer scientists, heritage managers, data engineers, archivists and everybody else who has to work with the recording and processing of digital archaeological data. We welcome scientific papers as well as anecdotal storytelling.

References

[1] Cowley, D.C. (2016). What Do the Patterns Mean? Archaeological Distributions and Bias in Survey Data. In: Forte, M., Campana, S. (eds) Digital Methods and Remote Sensing in Archaeology. Quantitative Methods in the Humanities and Social Sciences. Springer, Cham. https://doi.org/10.1007/978-3-319-40658-9_7

[2] Austin, A., Heilen, M., McEwan, C., Uhl, S. & Wolf, E. (2024). Improving the Usability of Archaeological Data through Written Guidelines. Advances in Archaeological Practice, 12(2), 123–135. https://doi.org/10.1017/aap.2023.30

[3] Anderson, D.G. (2024). Modern Archaeological Research and the Importance of Properly Reported and Curated Data. Proceedings of the National Academy of Sciences, 121 (16) e2403792121, https://doi.org/10.1073/pnas.2403792121.

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S47: Artificial Intelligence, a Step into the Post-digital Era of Archaeology?

Session Organisers:
Grégoire van Havre, Universidade Federal do Piauí
Kayeleigh Sharp, Northern Arizona University
Mathias Bellat, Eberhard Karls University of Tübingen

Session Format: Other

Description

In the post-digital era in which we now exist, technology has been embraced and normalised such that we are disrupted by its absence rather than its presence (see Huggett 2015). While the post-digital paradigm strongly rejects the narrative of one-way technological progress and recognizes both the advantages and disadvantages of new technologies as engines of innovation, we have not yet fully realised the range of implications integration of AI poses. With hybridised coexistence of analogue and digital, formerly disruptive techniques like GIS or 3D modeling and spatial analysis have become

foundational in contemporary archaeological practice. It is within this intellectual environment that emerging AI techniques are being widely adopted. The critical question that emerges is whether such post-digital era technologies are being embraced without adequate consideration of the implications not only for preservation of archaeological sites but intangible cultural heritage as well. This question emerges with the current state of affairs emerging in AI today (Gattaglia 2025).

In May 2025, OpenAI launched a contest called "OpenAI to Z Challenge", aimed at locating archaeological sites in the Amazon region using OpenAI o3/o4 mini and GPT-4.1 (https://openai.com/openai-to-z-challenge/). As it was probably the first time a large public contest was launched on such an archaeological question, it also carried a lot of Indiana Jones-like discourse ("You are the digital explorer", "Discover secrets hidden under the canopy") and a popular colonial mythology of Eldorado (the city of Z). Among the open data indicated were "high-resolution satellite imagery, published lidar tiles, colonial diaries, indigenous oral maps, past documentaries, archaeological survey papers" calling, in effect, to a variety of possible AI applications in archaeology.

At nearly the same time, Bellat and Orellana-Figueroa et al. (2025) reviewed the trajectory of the use of AI in archaeology into six categories (classification of archaeological remains, predictive modelling, automatic structure detection, digital heritage, text analysis and taphonomic classification). In their conclusions, they insist on the necessity of common procedures and workflows, and on the limited availability of open data. As a result, they point out the exploratory dimension of most research. In parallel, Casillo et al. (2025), in their review of AI for cultural heritage practice, highlighted a lack of standardised datasets in their conclusion. Gattaglia (2025) assesses the importance of data availability and transparency, and draws ethical concerns over the invisible materiality of AI.

As computers become more capable of simulating human reasoning through the production of texts, images, and other digital content, it is worth asking about their impact on archaeology and on the production of knowledge about past societies. While the idea of a fully robotic excavation remains in the realm of science fiction, we can already glimpse the possibility of producing and publishing research entirely through large-scale language (LLM) and computer vision (CV) models. Some questions to consider include: Is it possible to identify such models if not clearly stated? What would the bias be? What does this mean for science? How might this influence understanding of the past and the construction of the present? Are there any foreseeable consequences? Is it possible to slow or even stop the damage? Who has access to current tools and who benefits from them? Such are the practical and ethical questions archaeology must address as soon as possible, and which form the basis of this session, as future archaeologists will graduate with an LLM right in their pockets and CV detection will be the norm.

Session aim

This session aims to be a marketplace of ideas and suggestions, of collaborations and knowledge transfer. Specifically, it aims to explore questions about the analytical and ethical use of AI in archaeology, including, but not limited to, those mentioned above. We wish to gather people interested in using Artificial Intelligence on their data, but who don't know how to do so, and people who know how to, but lack data. We call for those who

would like to test their models on new and unexpected datasets. While case studies are recommended, we understand they may be incomplete.Some questions for consideration include: How does AI safeguard the respect and collaboration with Native and traditional people? How accurately does AI reproduce and represent the past? As in the case of *OpenAI to Z Challenge*, are certain aspects of colonial mythology already embedded in it? Do the results of the application of AI on archaeological data necessarily relate to past people? What are the possible implications in the present and in the future?

Accessibility & Ethics

We encourage accessible presentation materials, plain-language summaries, and disclosures on data sensitivity, cultural considerations, and potential harms. Work with restricted data should outline mitigation strategies (e.g., redaction, differential access). Please state open vs closed-world assumptions and how constraints affect the inclusion/exclusion of sensitive entities.

Special Interest Group

This session is organised by the CAA SIG on Machine Learning.

Other Format Description

This session is open to short submissions. We expect their authors to focus on the exchange of data and protocols, as well as practical or ethical problems and solutions.

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S48: Beyond Empowerment: Measuring the Impact of Mobile GIS in Field Archaeology

Session Organisers:

Julia M. Chyla, Faculty of Archaeology, University of Warsaw
Nazarij Buławka, Faculty of Archaeology, University of Warsaw
Adéla Sobotkova, Aarhus University
Giuseppe Prospero Cirigliano, Scuola IMT Alti Studi Lucca

Session Format: Standard

Description

"Mobile GIS is a GIS for users who are on the move" (Lee 1993). Since its early adoption in archaeology (Pundt 2002; Tripcevich 2004), the technology has been celebrated for empowering archaeologists and communities, enabling efficient mapping and data collection even in underfunded, remote projects. Two decades on, Mobile GIS has become routine in fieldwork. This session asks: what does empowerment actually look like, and how can it be measured?

We invite contributions that move beyond anecdote to critically evaluate the utility and durability of Mobile-GIS-based workflows in practice. Evidence-based comparisons—before and after a shift in toolkits, or between "in-the-field" and "in-the-office" workflows—are especially welcome. Evaluations might consider: reduced setup costs and administrative labour; technical debt and technical lock-in; ease of producing FAIR data; robust and low-maintenance data pipelines; improved team participation and community engagement (visible in data reuse, data compatibility with official registers, and other secondary benefits). Legal and regulatory contexts, where digital field records can function as admissible documentation, also form part of this evolving landscape.

We also welcome methodological critiques that address the long-term sustainability of Mobile GIS practices. How resilient are current workflows to offline environments, overheated batteries, directorial tinkering, and emergent field realities, including volunteers taking pictures obsessively? What evidence demonstrates the scalability of these systems and their ability to generate rich, interoperable datasets for national and research archives? And as AI tools increasingly enter the discourse, what realistic role—if any—do they play in contexts where field conditions remain largely immune to network-dependent automation?

We invite case studies, evaluations, and critiques that help the community take stock of where field data collection is today, and where it is heading.

Guiding questions

- What measurable evidence supports claims of empowerment and utility?
- How sustainable are current Mobile GIS workflows over 5+ years?
- What trade-offs between ease, cost, and data quality emerge in practice?
- Where, if anywhere, does AI meaningfully fit into field data collection today?

Other Format Description

The session will begin with an introductory presentation by the chairs, focused on the guiding questions and the main theme of both the conference and this year's session. This will be followed by the authors' presentations. The session will conclude with a general 15–20 minute discussion and round table, summarizing the key points of all presentations and addressing the most pressing issues within the methodology, workflows, and wider discourse on the use of Mobile GIS in archaeology. The discussion will be led by the chairs and will actively involve all authors participating in the session.

References

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S49: Bridging Micro and Macro Perspectives in the Modelling of Past Human Ecosystems

Session Organisers:
Eleftheria Paliou, University of Cologne
Andreas Angourakis, Ruhr University Bochum; University of Cologne

Session Format: Standard

Description

Ongoing and current discourse in socio-ecological research has highlighted the need to explore the types and intensity of human–environment interactions across a variety of temporal and spatial scales (Roberts et al. 2024; Kintigh et al. 2014). Computational archaeology is integral to such investigations, since it enables the study of the dynamic interplay between human behaviour and environmental change, including shifts in climate, vegetation cover, and faunal and floral populations, through a deep-time and multi-scalar perspective. At the macro scale, advances in computational modelling and the growing availability of large datasets on past settlement distributions, radiocarbon dates, and climatic

variables have highlighted broader trends and aggregate patterns in the archaeological record, suggesting reciprocal influences between altering socio-economic and environmental conditions. Nonetheless, a deeper understanding of the local processes that give rise to macro-patterns is notoriously challenging to achieve. This difficulty stems from several factors: the uneven availability and quality of archaeological and environmental data across regions, the problem of equifinality (i.e. distinct pathways can produce similar large-scale outcomes), and the tendency of macro-scale analyses to smooth over local dynamics and short-term fluctuations, thereby obscuring the causal mechanisms that operate at finer scales. On the other hand, microscale studies have offered essential insights into the dynamic relationship between human societies and ecological change at the local level. Especially notable is the contribution of ethnoarchaeological approaches that look into the ecological perspectives of Indigenous and local communities (Sherjon et al. 2015; Whitaker et al. 2023; Pisor and Jones 2021; Welch-Devine et al. 2020), and multidisciplinary research that brings together high-resolution data from material, archaeobotanical, zooarchaeological and paleoenvironmental studies. However, the value of local level understandings for socio-ecological research is increasingly scrutinised due to concerns regarding their direct applicability across diverse contexts and the difficulty of making valid cultural parallels. In this respect, computational approaches, such as Agent-Based Modelling (ABM), that gain insights from ethnoarchaeological and small-scale studies offer significant methodological advantages, as they focus on exploring microscale processes, rather than relying on direct cultural analogies, allow rigorous hypothesis testing, and have the potential to highlight non-linear feedback between local and global processes.

This session aims to bring together micro and macro perspectives on the modelling of past human ecosystems, seeking a more comprehensive understanding of the interdependence between microdynamics and macro patterns. It invites contributions discussing cross-scale approaches to computational modelling and theoretical frameworks that seek to make explicit the links between local-level human action and global environmental impacts. Furthermore, we are particularly interested in approaches to computational modelling that gain insights from Indigenous and traditional ecological knowledge. We also encourage contributions that explore the socio-ecological dynamics of resource use, depletion, and renewal, as well as interdisciplinary eco-archaeological approaches that bring together ethnoarchaeology, archaeological science methods, and computational modelling. More broadly, we invite works on computational modelling (e.g., simulations, GIS-based models, equation-based models, agent-based models, etc.) which look into:

- The response of hunter-gatherer, agropastoralist and urban populations to ecological change
- anthropogenic impacts on the environment in the long- and short-term, at smaller and larger spatial scales
- ecological sustainability and resilience in the past and present
- technological advances in computational modelling of socio-ecological systems

References

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S50: Heritage under Bombs - Mitigating Destruction in Rapidly eEolving World

Session Organisers:

Nazarij Buławka, Non-Invasive and Digital Archeology Laboratory (PANiC), Faculty of Archaeology, University of Warsaw
Oleksandra Ivanova, National University of Kyiv-Mohyla Academy
Huyam Khalid Mohammed Madani, Cardinal Stefan Wyszyński University in Warsaw
Mariia Lobanova, Odesa Archaeological Museum of the NAS of Ukraine

Session Format: Other

Description

Tangible and intangible cultural heritage shape people's sense of identity and their sense of belonging. Heritage is particularly vulnerable during periods of political instability. It can become a silent victim of war through destruction, use in military activities, looting and cultural appropriation, can be politically abused, or be used as a tool to whitewash war crimes. Heritage destruction can be accidental or a deliberate, systemic tool of 'cultural genocide',

which aims to erase the memory of individuals and evidence of past communities' existence and culture. Whereas, looted artefacts appear on the black market and are used to purchase weapons, thereby exacerbating further violence (Hanson, 2011).

The situation of heritage is extremely threatened because of the ongoing conflicts and wars around the globe, and the United States' plan of withdrawal from UNESCO. During 2025, we witnessed a third year of the full-scale Russian invasion of Ukraine, continued destruction of Gaza, the war in Sudan, Tigray (Ethiopia), the Democratic Republic of the Congo, India-Pakistan, and Cambodia–Thailand border conflicts, and many more.

During the ongoing war Ukraine's heritage is being constantly destroyed by Russia and artefacts looted. At the same time, such cases as rebuilding of Tauric Chersonesos in occupied Crimea, condemned by UNESCO committee, is an example of cultural appropriation and political abuse of heritage (Mick 2024; Munawar and Symonds 2024; Shydlovskyi et al 2023). Such a violent process is not unique; the situation in Ukraine has received widespread media coverage. In many areas affected by war and political instability, heritage protection is often inadequate and can undergo a similar process. However, information about such situations rarely reaches outside audiences. For example, scholars working in the Tigray region (Ethiopia) report that many museums were looted, and that heritage professionals face particular challenges due to the presence of explosives at destroyed sites.

Since April 2023, Sudan has been experiencing a widespread armed conflict, resulting in a severe humanitarian crisis and the deterioration of security across various regions. This conflict has had devastating effects on cultural heritage, with significant archaeological sites and several museums being affected. Preliminary reports indicate that the damage to archaeological sites may be linked to large-scale population displacement, which led to the use of some sites for housing and agriculture in the absence of adequate protection. More than nine museums across Sudan have also been affected, notably the Sudan National Museum, which was used as a military base, resulting in direct damage from military operations and the looting of its collections. The National Ethnographic Museum, which was completely destroyed by fires caused during direct confrontations. Heritage workers have not yet been able to access museums in the Darfur region to assess the extent of the damage. This situation poses a threat not only to Sudanese cultural heritage but also to the heritage of humanity and calls for urgent action by local and international authorities to safeguard these historical assets from further destruction.

Digitization is emerging as one of the most effective tools for safeguarding heritage in conflict zones, enabling the creation of detailed, shareable, and enduring records of at-risk sites and artefacts. As shown by Radchenko and Hadick (2024) in the Ukrainian context, preserving cultural heritage through digital means is an interdisciplinary challenge, requiring not only technology and equipment but also trained specialists, sustainable funding, and sufficient time for data collection, processing, and dissemination. In Ukraine, where ongoing hostilities continue to endanger heritage and reduce the number of professionals able to respond, digitization has become both an urgent priority and a logistical challenge. This experience demonstrates that digital preservation efforts in war zones must be internationally supported, well-resourced, and embedded within broader strategies for heritage protection.

During the last CAA meeting in Athens, we discussed the situation of heritage in Sudan, Ukraine, Ethiopia, Syria, Egypt, Armenia, and Azerbaijan. One of the key conclusions of the session was that the CAA must prioritise sessions focused on heritage protection, as this could help develop and introduce new methods and procedures in war zones. A plan for creating a Heritage Under Bombs special interest group was proposed. This meeting will continue to discuss the importance of developing digital methods to document heritage before it is lost.

The session aims to bring together researchers from areas affected by conflict and war, who are deeply concerned about the future of heritage, as well as specialists in digital methods. The session welcomes papers devoted to monitoring archaeological heritage in conflict zones, focused on:

- Inventories, databases for heritage preservation, and Linked Open Data.
- Monitoring: remote sensing (from satellite to uncrewed aerial vehicles, UAV) and citizen science;
- Digital twins: photogrammetry and laser scanning;
- Reports of heritage destruction;
- Heritage protection initiatives.

Other Format Description

The session will consist of 20-minute presentations, followed by an extended discussion block at the end.

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S51: From Satellite to Unmanned platforms, the Computation of LIDAR Sataset for Archaeological and Heritage Projects

Session Organisers:

Moisés Hernández Cordero, Austrian Archaeological Institute (ÖAI-ÖAW)
Irene Petschko, Austrian Archaeological Institute (ÖAI-ÖAW)

Session Format: Standard

Description

LIDAR (light detection and ranging) is becoming a survey technique intensively used in archaeological prospections as well as in Building Heritage (Doneus, M. et al., 2020, Fontana, G. 2022, Parcero-Oubiña, C 2022). However, most presentations in archaeological sciences focus on analysing the results obtained by LIDAR rather than explaining why LIDAR was considered more appropriate than other techniques. Usually, papers with a more technical approach are dedicated to illustrating how historical features were detected (Orengo, H.A.,

Petrie, C.A, 2018, Stott, D. et al., 2015, Kokalj, Ž., Mast, J. 2021) or how the filtering of vegetation (Doneus et al., 2020, Brede et al., 2022) was accomplished. Some others gather instances of the use of LIDAR in archaeology but without analysing quality or reasons for selecting this technique vs others (Stott, D. et al., 2015, Vinci et al., C, 2024). Only few are dedicated to standardizing procedures when processing or presenting results for archaeological projects (Kokalj, Ž. 2025). Recently, with the introduction of machine learning for data analysis, new approaches to query the data are being published with greater focus on the postprocessing phase (Trier et all, 2019, Verschoof-van der Vaart et al., 2020, Berganzo-Besga, I. et al., 2021, Doneus et al., 2022).

This session would like to explore different applications of the LIDAR, shifting the focus from the overall research results to the previous technical phase within a project. The idea is to discuss/debate the use of LIDAR for heritage projects based on:

- what platform do they use (Satellite, plane or UAV) and why (resolution, cost, accessibility flexibility),
- how this might affect the final product (point cloud, raster) and the research questions of the project,
- new processing methodologies (filtering vegetation, noise removal, feature detection, software comparison/alternatives, ...), and
- encountered problems in the data acquisition and the post processing phase (filtering vegetation, identifying features…).

We invite researchers interested in computation workflows, comparison of surveying techniques, cost-effect, quality of recorded data and setbacks during processing to present in this session. We welcome talks dealing not only with successes in the application of LIDAR but also with difficulties and failures that occur when delivering data and results, “the process of learning a craft often involves making mistakes along the way” (Gómez Coutouly et al. 2021).

Overall, through this session we wish to focus in the exchange of experiences and discussion of senior/experienced scientist and technicians as well as junior researchers regarding the use of LIDAR for their projects. We believe that this topic might open new avenues and approaches to guide projects interested in applying this technique in the future.

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S52: Beyond Fun and Games? Rethinking Archaeogaming, Play, and DigitalHeritage

Session Organisers:

Aris Politopoulos, Leiden University

Sebastian Hageneuer, Berlin-Brandenburg Academy of Sciences and Humanities

Session Format: Standard

Description

What happens when archaeology meets play? Archaeogaming has grown from a niche into a lively field, exploring how games and playful media intersect with archaeological research, heritage practices, and public engagement. Building on last year's discussions, this session continues to open the field — but shifts the focus more explicitly to questions of accessibility, inclusivity, and the critical limits of play.

We invite contributions that explore how playful tools — from video and board games to VR installations, museum interactives, and game engines — shape archaeological knowledge, communication, and teaching. Play and games clearly provide opportunities for experimentation, collaboration, and joy. Yet we also ask: what happens when play is not universally fun? How do these media exclude or marginalize particular audiences? How do they unintentionally reinforce narratives, power structures, or cultural stereotypes?

Accessibility is central here: games and playful experiences can widen participation in archaeology, but they can also create new barriers. Physical disabilities, technological requirements, and linguistic or cultural differences can all shape who gets to play — and who remains excluded. Similarly, inclusivity demands attention to representation and diversity: whose pasts are being told through games, whose bodies and voices are included or omitted, and how can archaeogaming be a platform for decolonial and feminist perspectives (Gray 2020; Nakamura 2009; Politopoulos/Mol 2023)?

The "limits of play" also invite critical scrutiny. While play has often been seen as inherently liberating, recent scholarship highlights that games can also capture and constrain, reinforcing dominant ideologies or even reproducing systems of surveillance capitalism and extractive economies. In archaeology, too, playful tools can unintentionally "gamify" heritage in ways that flatten complexity, privilege entertainment over reflection, or exclude traditional forms of non-western play.

At the same time, archaeogaming is uniquely placed to experiment with alternative forms of being. Game engines and playful design can be harnessed for critical storytelling, participatory heritage projects, and collaborative learning environments (Graham 2020; Reinhard 2018, 2024). New technologies such as generative AI, immersive XR, and interactive platforms open up further possibilities — but also demand new ethical considerations.

By highlighting both opportunities and risks, this session aims to provide a more balanced perspective on playful archaeology: one that recognizes its capacity for experimentation and joy, while remaining attentive to its exclusions, blind spots, and unintended consequences. We particularly welcome contributions that cross disciplinary boundaries, engage with community-based practices, or present creative and experimental approaches.

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S53: Advances in Computational Archaeology

Session Organisers:
Joshua Emmitt, CAA Chair
Jeffrey Glover, Georgia State University

Session Format: Standard

Description

Do you have a computational archaeology topic or project to present outside of the scope of one of the existing sessions? Are you engaged in cutting-edge research on geophysics, data management, visualization techniques, semantic web, or another digital archaeology topic that you would like to share? Papers accepted into the "Advances in Computational Archaeology" session for the final program will be grouped thematically, as practical, to create related blocks of papers.

For the ease of the review process, please select the most closely related topical session as your primary choice when uploading in the CMT submission system. Then select this session as the secondary option to indicate that you feel that your paper is not a strong fit for the primary one chosen.

S54: Poster Session

Description

This session is dedicated to poster submissions.

A**bstracts** (200-500 words, plus up to 3 citations) will be required for posters. Your abstract should include:

- Subject – a description of the methods used and key results (scientific posters), or main argument (discursive or theoretical posters);
- Background – a summary of the topic or research question addressed by the poster;
- Discussion – a discussion of the wider implications of your research for computer applications and quantitative methods in archaeology;
- References – up to 3 citations (cited using the Chicago Manual of Style 17th Edition Author Date format, see below).

Your abstract should contain sufficient information to allow the CAA Scientific Committee to evaluate the scientific content of your poster. You may include a single figure that shows the key results or main argument of your paper.

Accepted posters will be displayed during the conference. Authors will be invited to make an optional short presentation about their poster during the session.

Round Table Descriptions

S24: Real-World Perspectives on Building Research Data Infrastructures: Community Practices, Legal Contexts, and Implementation

Session Organisers:

Christin Keller, German Archaeological Institute
Agnes Schneider, Leiden University

Session Format: Round table

Description

Session Format

Round table (90 minutes, with short statements from panelists followed by open discussion)

Background and Motivation

Archaeology, like all sciences, is entering an era where the volume, complexity, and interconnectivity of data are central to research progress. From excavation records and 3D models to GIS layers and analytical datasets, archaeological research increasingly depends on the ability to store, preserve, share, and analyse data in interoperable, sustainable, and trusted environments.

In other scientific disciplines, research data infrastructures (RDIs) have already become the backbone of collaboration and discovery. If archaeology is to keep pace with these developments, it must ensure that such infrastructures are **not only technically operational, but also widely adopted and embedded in everyday research practice**. Without this combination of functionality and uptake, archaeology risks falling behind in the wider scientific landscape.

This is particularly relevant to the CAA community, which thrives at the intersection of archaeology, computing, and quantitative analysis. The power of advanced methods—statistical modelling, machine learning, network analysis, and simulation—relies on having **large, well-curated, and accessible datasets**. Without robust infrastructures that enable aggregation, interoperability, and reuse, the potential of these methods cannot be fully realised.

Across Europe, RDIs for archaeology exist at different stages of maturity:

- **Established services** with decades of experience in preservation and dissemination.
- **Mid-career infrastructures** that have proven their value and are scaling their operations.
- **New initiatives** still defining their scope, governance, and technical frameworks.

Understanding how these infrastructures develop, gain acceptance, and adapt is not just a matter of institutional interest—it is a prerequisite for archaeology to remain an evidence-driven, data-rich, and methodologically innovative discipline.

Scope and Goals

This round table will bring together representatives from archaeological RDIs in different countries to exchange practical, experience-based perspectives. Our goals are to:

1. **Compare engagement models** — How do top-down institutional approaches differ from grassroots, community-driven models? How are archaeologists incentivised to contribute data? What roles do professional associations and informal networks play?
2. **Examine trust and acceptance** — What makes researchers, heritage professionals, and institutions actually choose and use an infrastructure? How do early-stage projects build credibility, and how do mature infrastructures sustain it?
3. **Share operational challenges and lessons learned** — Insights into technical deployment, training, support, funding continuity, and sustainability planning.
4. **Explore different stages of development** — How do priorities, risks, and opportunities change from the early phases to long-term operation? What can young initiatives learn from established ones, and how do established infrastructures stay agile?
5. **Analyse legal forms and frameworks** — How do organisational structures (federated vs. centralised, public bodies, consortia, non-profits, etc.) and differing national or EU legal environments affect governance, data policies, and the ability to collaborate internationally?

Comparative Dimension

A central feature of this session is its explicitly comparative approach. By bringing together infrastructures that differ in **community size, governance model (federated vs. centralised), juristic form, funding environment, and stage of development**, we will highlight both common challenges and distinctive solutions. The discussion will not only compare archaeological infrastructures across national contexts but also set them in relation to established examples such as the **Archaeology Data Service (UK)**, community-driven organisations like **CAA International**, and interdisciplinary frameworks such as the **Research Data Alliance**. This comparative lens will ensure that the session moves beyond isolated case studies to identify transferable lessons, structural constraints, and opportunities for cross-disciplinary collaboration.

Format and Structure

The round table will be structured for maximum interaction:

- **Opening statements**: Each panelist will have 5–7 minutes to introduce their infrastructure, national context, and position on the themes above.
- **Thematic discussion blocks**: The moderator will guide the conversation through the five key themes, drawing comparisons and encouraging panelists to reflect on successes, failures, and unexpected challenges.
- **Audience engagement**: Participants will be invited to contribute their own experiences, pose questions, and comment on the applicability of different approaches in their contexts.
- **Summary and recommendations**: The session will conclude with collaboratively defined takeaways, which will be documented and shared with the CAA community.

Expected Audience

We expect this session to attract:

- Archaeologists and heritage professionals involved in data management or infrastructure projects.
- Members of the CAA community working with quantitative methods who depend on large, interoperable datasets.
- Policy makers, funders, and administrators concerned with digital research sustainability.
- Students and early-career researchers looking to understand and influence the future of archaeological data sharing.

Relevance to CAA 2026

The CAA community is uniquely positioned to benefit from and contribute to the development of archaeological RDIs. This session addresses core concerns of the conference:

- **Advancing quantitative archaeology** by enabling large-scale, high-quality datasets for analysis.
- **Strengthening international collaboration** through shared infrastructure models and interoperability.
- **Bridging policy and practice** by comparing how national contexts and legal frameworks shape the reality of implementation.
- **Encouraging sustainable, community-driven solutions** for data preservation and access.

If archaeology is to continue evolving as a data-intensive science, it must ensure that RDIs are not just technically sound, but fully embedded in the discipline's workflows. This round table will directly address how to achieve that goal.

Expected Outcomes

By the end of the session, participants will have:

- A comparative map of how archaeological RDIs operate in different legal, organisational, and community contexts.
- Insights into how infrastructure maturity shapes priorities and challenges.
- Practical strategies for fostering trust and adoption in digital services.
- A clearer understanding of the role infrastructures play in enabling large-scale quantitative methods in archaeology.
- A set of shared recommendations for the CAA community and beyond.

The discussion outcomes will be summarised and shared publicly after the conference in paper form, ensuring that insights reach practitioners who could not attend.

S35: Chronological Modelling III: a Round Table on Time in Computational Archaeology

Session Organisers:
Thomas Huet, CNRS
Eythan Levy, University of Zurich

Session Format: Round Table

Description

This round table aims at discussing the current challenges and future perspectives on the modelling of time in archaeology. Duration: 2h30.

Some 30 years ago, the introduction of GIS into the archaeological toolbox sparked a 'spatial turn' in the discipline, greatly improving the interoperability of spatial data. However, no such integrated tool exists for managing temporal data. Chronological methods are highly diverse (e.g., seriation, stratigraphy, cross-dating, absolute dating), each typically handled by different software applications and libraries. The lack of interoperability between software outputs, formats and standards hinders the ability to understand cultural developments across different societies. In our view, the time has come to make chronological data more interoperable through the use of standardised formats (e.g., EDTF), relative temporal relationships (e.g., before/after), and specialised software (e.g., OxCal). Such an approach could pave the way for a Temporal Information System (TIS), enabling the calculation of a temporal metric for the rate of human cultural evolution (see our position paper: Huet & Levy, 2025).

We invite all interested colleagues to participate in the open-forum discussion at the round table.

Position paper

Huet, T., & Levy, E. (2025). Foreword – Archaeometry special issue on chronological modelling. *Archaeometry*, 67(S1), 1–6. https://doi.org/10.1111/arcm.13095

Session organisation

- **Foreword [5-10 minutes]**

Thomas Huet and Eythan Levy

- **Topic 1: Epistemology of archaeological time** [30 minutes]

chair: Joan Anton Barcelo

History and Archaeology, sciences of societies in time, are based on the ordering and clustering of events, but differ mainly on the different nature of the proxies they use. History uses mainly authored time-stamped writings (e.g., diplomatic letters, political writings) while Archaeology uses anonymous time-uncertain material culture (e.g., ceramic and stratigraphic sequences). How can such archaeological series be grouped to create periods? To what extent can two periods be considered as contemporaneous?

- **Topic 2: Archaeological time in practice: cross dating, anchor dates, cultural periods** [30 minutes]

chair: Keith May, James Taylor

Archaeologists often deal with multi-aligned chronological data: a piece of material culture can be related to a stratigraphic unit containing other objects, to site-wide stratigraphy with groupings and phasing, to broader landscape and/or cultural periodisation, to seriation, to artifact types found in other archaeological cultures, and to so-called 'absolute' dates from scientific dating methods (e.g., radiocarbon dates). How, in practice, are these data aligned with each other? How is uncertainty propagated over different chronological assessments?

BREAK: 15 minutes

- **Topic 3: Formats, standards and interoperability** [30 minutes]

chair: Florian Thierry

Deterministic dates, whether seemingly exact (e.g., 79 AD), approximate with uncertainties (e.g., 80/81 AD), or relative (e.g., after 68 AD), can be encoded unambiguously using standards such as ISO 8601, EDTF, or OWL-Time. Such date expressions can serve as the basis for space–time gazetteers (e.g., PeriodO and ChronOntology) and be reused in ontologies (e.g., CIDOC CRM). However, these formats, gazetteers and ontologies cannot directly express probabilistic temporal distributions, such as those derived from radiometric dating. Furthermore, the different ad hoc chronological formats and syntaxes used by chronological software (e.g., OxCal, ChronoModel, or ChronoLog) add a further layer of complexity. How can we foster interoperability between all these formats and standards?

- **Topic 4: Mathematics, Algorithms and Software** [30 minutes]

chair: Joe Roe

A host of mathematical methods and algorithms exist for both deterministic and probabilistic temporal assessments in archaeology. Software packages (libraries), as well as interactive software applications, are being used to solve a wide variety of chronological problems, such as seriation, Bayesian calibration of radiocarbon dates, or chronological network modelling. Mastering the whole array of available chronological methods, algorithms and tools can be challenging. Is a unified, standardised approach feasible and desirable? And if so, what concrete steps can be taken to achieve it?

- **Conclusion: Towards a Temporal Information System?** [5-10 minutes]

S41: New Advances and Directions of 3D Analysis in Archaeology

Session Organisers:

Corey Noxon, Ritsumeikan University
Markos Katsianis, University of Patras
Wilhelm Kerle-Malcharek, University of Konstanz
Jannis Werner, University of Cologne

Session Format: Round Table

Description

The field of 3D analysis has made significant advances since the formation of the 3D Spatial Analysis SIG at CAA Tubingen in 2019 (e.g. Hostettler et al. 2024). A founding aim of the SIG

was to define the meaning of 3D Spatial Analysis, with early efforts focusing on larger scale GIS-based approaches to better incorporate three-dimensional data into modern archaeological practice. Since that time, the possibilities for digitizing objects—particularly cultural heritage objects—have reached levels of quality, ease of use, and availability that make it possible for anyone with a smartphone to engage in the process and now forms part of the standard toolkit for many practitioners. Significant improvements in 3D capture technology and accessibility since the founding of the SIG has prompted the need for a re-evaluation of 3D technologies, analytical approaches to the ever-increasing corpus of 3D data, and ways in which we can better incorporate these advances into analytic and synthetic knowledge-building workflows.

Reflecting these changes, the 3D Spatial Analysis SIG is updating its name to the 3D Analysis SIG and is looking to update its aims and goals to better reflect the current technological and analytical landscape. As part of this process of update and renewal, this roundtable session will have participants discuss the state of the field, identify the gains we've made, the areas where we need to improve, and where we aim to go moving forward. Discussion will initially be focused on the following topics: definition of 3D analysis in archaeology, practical applications of 3D analysis in archaeology, project management, "best practices" for data management, 3D outputs directed towards other researchers and the public at large, and new directions for the SIG in general.

Recorded 3D data has become a more mainstream method to display artifacts and other archaeological data, but data reuse for analytical purposes still has a lot of room to grow. Participants will discuss improvements in archaeological applications of 3D data as well as new and upcoming analytical approaches. While GIS applications remain as relevant as ever (e.g. Dell'Unto & Landeschi 2022), the increased accessibility of 3D digitization makes object-based analytical approaches like GMM more accessible as well. In addition to these approaches, recent work related to room illumination and similar visual-based approaches are just a small sampling of the ever-increasing analytical approaches that are opening up to archaeologists and serve as starting points for further discussions.

As photogrammetry and other forms of 3D digitization become more commonplace for recording sites, features, and artifacts both in the field as well as part of subsequent post excavation processing, how can we better integrate this "new" form of data within the broader assemblage of recorded archaeological data? How can the digitization of archaeological findings be positioned as an integral part of the archaeological process and archaeological project management? Are we at a stage in which certain aspects of digitization techniques, such as 3D scanning, can replace prior recording methods, or should multiple methods be continued in tandem? Are there ways in which 3D digitization can be better streamlined to smoothly integrate into existing workflows, whether it be on-site recording or lab-based documentation? What are ways in which we can better integrate 3D scan data into other forms of gathered data to help provide a more holistic and contextualized record of archaeological sites or features?

An equally important part of project management is data management. As data is gathered it must be organized and stored. While less glamorous than other aspects of 3D work in

archaeology, the manner in which data is organized and stored becomes increasingly more important as the amount of gathered 3D data increases. Multiple discussions have been had stressing the importance to data management practices like FAIR and CARE, but broadly accepted implementations of these ideals are still far from standardized. Taking a broader view, long-term archival storage of 3D data is another pressing topic of serious importance to the field. Existing database structures are rarely suited for the large file sizes involved in 3D, whether it be large high resolution models, or the hundreds or thousands of images used to create photogrammetry-based scans. If the totality of the gathered and processed data is too large to store long-term, are there any particular types of data that we all agree should be stored as a minimum? What files types and formats should data be stored in? Are some lossy formats "good enough", and if so, how lossy can they be? If archiving 3D models is difficult, how difficult is it to archive the results of 3D analysis? A shared understanding of the realities of these data management challenges could help to provide some realistic guidelines for practitioners moving forward.

Finally, 3D recordings of archaeological sites, features, and artifacts are significantly multi-functional in nature. The same 3D models that are processed for analytical purposes can also be processed for broader public consumption. One of the most approachable methods for this is preparing an individual artifact or component for public access on a 3D model viewer, but uncertainty related to commercial platforms calls into question the long-term sustainability of this approach and stresses the importance of alternative platforms and modes of model presentation. The contexts of objects play a key role in our understanding of objects, and while there has been some work in the field, developing and implementing ways in which individual 3D objects can be better visualized within broader contexts for public consumption and incorporated into a larger site narrative seems another area to be further explored. Incorporating AR and VR technologies is another way in which we can possibly provide new ways to create immersive environments to help provide better spatial understandings of cultural heritage sites. While advances have been made along these lines as well, there still seem to be significant barriers in their implementation. Rather than focusing on individualized approaches to these issues, are there ways in which a shared platform can be developed to further improve accessibility in this form of data presentation?

The problems and opportunities facing 3D analysis in archaeology evolve and change as the field moves forward and are too numerous for any individual to tackle on their own. This roundtable will hopefully provide a chance to pool the experience, background knowledge, and additional resources of the participants to help identify, discuss, and continue to engage in these areas of movement in the field. With the renewal of the 3D Analysis SIG we hope to be able to continue these discussions and work in a more closely connected and collaborative manner in an attempt to move beyond a patchwork of isolated solutions and help drive the field forward together.