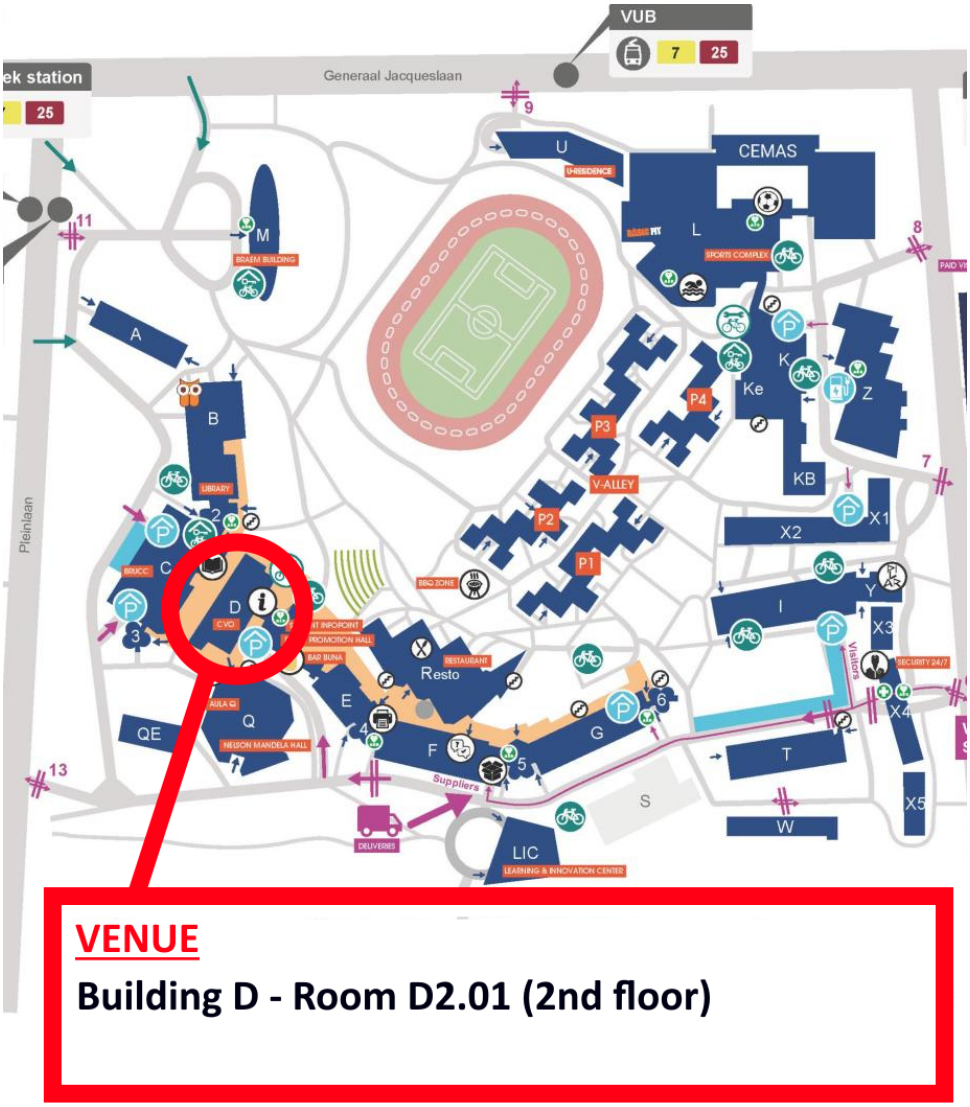
CAA NL/FL LOCAL CHAPTER MEETING – 2025

Vrije Universiteit Brussel, 9–10 December 2025

CAA Netherlands/Flanders is pleased to welcome you at the 2025 local chapter meeting. The event is organized by AMGC at the Vrije Universiteit Brussel (VUB) and will be held in the Promotion Hall (D2.01) at the VUB campus in Etterbeek. Organising Committee: Ralf Vandam, Devi Taelman, Polte De Weirdt, Dries Vergouwen, Rosie Campbell, Patrick T. Willett

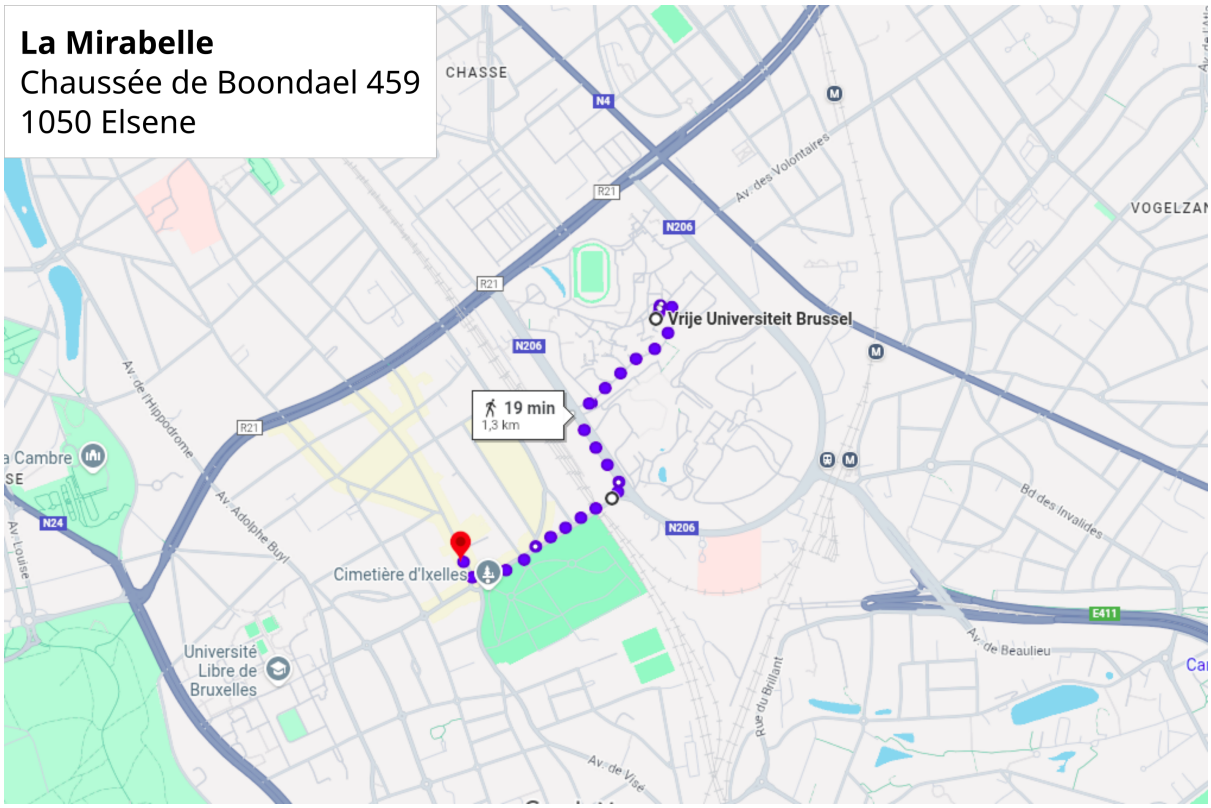
Participation is free of charge, but registration is required via this link.

Speakers can upload their presentations via this upload link.



Conference Dinner – Practical Information

For those of you who registered for the dinner, we will meet at Restaurant La Mirabelle (Chaussée de Boondael 459, 1050 Elsene) at 19:00. The restaurant is approximately a 15–20 minute walk from the VUB Etterbeek campus



Programme

Each paper will be 20 minutes long, followed by a 5-minute Q&A session.

Day 1 – Tuesday, 9 December 2025

12:30 – 12:50 Registration

12:50 – 13:00 Welcome, introduction and practicalities

Session 1 – Data Analysis & Quantitative Methods

13:00 – 13:25 **Dries Daems**
Pottery Networks in Late Hellenistic and Early Roman Anatolia and Levant

13:25 – 13:50 **Laura Van der Knaap**
Connecting demographic agent-based models to skeletal data: the case of the Roman cemetery at Tiel-Passewaaij

13:50 – 14:15 **Marta Galindo Díaz**
Ancient Cities, Modern Tools: Quantifying the Environmental Impact of the Roman Bath-Gymnasium at Sagalassos through LCA

14:15 – 14:40 **Hannah James**
From Baselines to Origins: Quantitative approaches to reconstructing human and animal mobility using strontium isotopes

Session 2 – Data Management & Data Architecture (Parts I & II combined)

14:40 – 15:05 **Wouter Yperman**
The 25 year road towards digital field recording

15:05 – 15:20 Coffee break

15:20 – 15:45 **Matthias Lang**
From PDF to DataFrame: A Pragmatic Workflow for Extracting Roman-Era Archaeological Data from Legacy Reports

15:45 – 16:10 **Florian Thiery**
Bridging Stones and Volcanoes: Can Semantic Modelling, Visualisation, and Little Minions Bridge Archaeology and Geosciences?

16:10 – 16:35 **Ben Bellefroid**
Echoes from the Past: a Citizen Science Platform for Archaeological LiDAR Prospection

16:35 – 17:00 **Phaedra Criaco**
Managing Legacy Data in Archaeological Science: A Cautionary Tale

Social drink / reception + Dinner (optional and at your own expense)

Wednesday, 10 December 2025

09:00 – 09:30 Registration

Session 3 – GIS Applications / Remote Sensing & Landscape Archaeology

09:30 – 09:55 **Dries Vergouwen**
Visualizing River Histories: A Digital Approach to the Senne Valley in Brussels

09:55 – 10:20 **Emma Legrand**
Understanding human mobility in northern Croatia: Combining strontium isotope analyses and GIS applications

10:20 – 10:45 **Simon Jaxy**
Semi-Supervised Modeling of Archaeological Potential in the Late Antique Sagalassos Area

10:45 – 11:00 Coffee break

11:00 – 11:25 **Andrei Kedich**
Detection of anthropogenic closed depressions in the Belgian Loess Belt and their relationship to archaeological evidence

Session 4 – Theoretical, Conceptual & Critical Approaches

11:25 – 11:50 **Chiara Giovannetti**
Humanity-Driven Digital Practices: Placing Human Practices, Bodies and Experiences at the Centre of Data-Driven Endeavours in Archaeology

11:50 – 13:00 Lunch break

13:00 – 13:25 **Alicia Walsh**
The Ethical Divide: Critical assessments of digital recording methods in Dutch archaeological practice

13:25 – 13:50 **Foteini Tsigoni**
Negotiation of Cultural Authority: 3D reconstruction of the Frankish Propylaea

Session 5 – Digital Documentation Techniques

13:50 – 14:15 **Rosie Campbell**
Reconstructing Dhaskalio: Integrating Legacy with Born-Digital Data

14:15 – 14:40 **Polte De Weirdt**
Old Data, New Horizons: 3D Modeling as a Catalyst for Recontextualizing Fragmentary Legacy Data

14:40 – 15:05 **Tuba Ünal**
Virtual reconstruction as a tool for presenting historical evolution of archaeological sites: Nysa ad Maeandrum

15:05 – 15:30 **CAA-NL-FL Annual General Meeting, conclusions and goodbye**

CAA NL/FL LOCAL CHAPTER MEETING – 2025

Vrije Universiteit Brussel, 9–10 December 2025

Abstracts

(sorted alphabetically on the first author)

Ben Bellefroid[1]

Echoes from the Past: a Citizen Science Platform for Archaeological LiDAR Prospection

[1] Independent researcher Roma Media

In recent years, LiDAR technology has proven to be a powerful tool for uncovering hidden archaeological structures in landscapes. By digitally removing vegetation, detailed elevation models reveal features such as burial mounds, embankments, ancient roads, and foundations. However, the interpretation of these large datasets remains a time-consuming and challenging task.
The project *Echoes from the Past* provides an innovative solution through a digital citizen science platform. Via a website and mobile app, thousands of volunteers—so-called "explorers"—are mobilized to systematically analyze LiDAR data. After completing a short training package on how to recognize landscape relics, participants are presented with small 200x200 meter tiles. They can mark potential structures, share observations, and interact through the platform. All contributions are validated by a scientific review board and compiled into a standardized database, which is made available for further research, forest management, and cultural heritage outreach.
The pilot project is situated in the Brabantse Wouden National Park (Flanders, Belgium), an area with an exceptionally rich archaeological archive that has been preserved—but also concealed—by centuries of continuous forest cover. Here, volunteers help identify burial mounds, Roman infrastructure, and post-medieval features. Their contributions support the creation of attention maps that assist sustainable forest management and help prevent damage to archaeological heritage.
Echoes from the Past demonstrates how digital participation and crowdsourcing can enhance archaeological prospection. The project accelerates the processing of large-scale LiDAR datasets, expands the scientific knowledge base, and simultaneously increases public awareness of cultural heritage. It highlights the potential of citizen science, innovative technology, and heritage protection to reinforce one another within a sustainable collaborative framework.

Rosie Campbell[1]

Reconstructing Dhaskalio: Integrating Legacy with Born-Digital Data and the Evolving Workflow of the Keros Project

[1] Archaeology, Environmental Changes & Geo-Chemistry research group (AMGC), Vrije Universiteit Brussel

This paper presents the development and application of a 3D GIS-based “living archive” by the Keros Project at the Early Bronze Age site of Dhaskalio, Keros. Designed to unify excavation, specialist, stratigraphic, and architectural data in a single spatial environment, the tool has enabled the integration of born-digital material from the 2016–2018 excavations with legacy data from the 2006–2008 seasons. Through the extrapolation of photogrammetric models and orthophotos from archival photographs, and the incorporation of 3D artefact and architectural data, we demonstrate how such a platform enhances reflexivity and spatial interpretation. The 2025 excavation season refined this workflow, introducing LiDAR-assisted photogrammetry via iPad Pros and a dedicated 5G-enabled field server, allowing real-time image upload and immediate processing on a the base on the island Koufonisi. This significantly reduced the time burden of data processing observed in previous seasons and points toward a scalable model for efficient, reflexive, and integrated archaeological documentation. The paper also reflects on the methodological and theoretical implications of building long-term, holistic digital archives for complex archaeological projects.

Phaedra Criaco[1,2], Brian Ballsun-Stanton[1], Ray Laurence[1]

Managing Legacy Data in Archaeological Science: A Cautionary Tale

[1] Macquarie University
[2] Rijksuniversiteit Groningen

In recent years archaeologists are facing an ever growing amount of legacy data generated using standard programs like Excel. A lot of large datasets are the result of multiyear projects accumulating data over large timespans. Often these datasets change in design along the way because of new questions arising during different stages of the research or the passing on of datasets to new generations with missing meta and/or para data. This was also the case for pXRf data collected of paving stones of roads in the Tiber Valley Project. Both pXRF and portable GPS were new technologies at that time, meaning there was no standard available for collecting or saving data of this kind. During restudy of this dataset it became clear that the missing metadata like field protocols and notebooks, asked for a different approach. The aim of this research was to test to what extent data management strategies could help in the reuse of legacy data from chemical analyses and how new data can be added to the original project, compared and made future-proof. Building on concepts like preregistration, this lead to the set up of a new database in SQL, with a data-loading protocol in R and git version control. This approach successfully transformed complex, messy spreadsheets into a queryable SQL database with standardized SELECT statements, enabled direct comparison between legacy and new pXRF data, and established version-controlled protocols that ensure data remains accessible and interpretable for future researchers.

Dries Daems[1], Danai Kafetzaki[2]

Pottery Networks in Late Hellenistic and Early Roman Anatolia and Levant

[1] Vrije Universiteit Amsterdam
[2] KU Leuven

The study of networks and connectivity aimed at uncovering the rich tapestry of complex interactions and exchanges that shaped ancient Mediterranean societies is a dynamic and multidisciplinary field that encompasses important contributions from archaeological, historical, and geographical perspectives. The Hellenistic world in particular, consisting of a large interdependent network of kingdoms, dynasties, cities, associations, and people spanning the Mediterranean, Black Sea, Near East, and Western Asia,

constitutes a rich context for the application of network analysis.
In this talk, we will present the results of a recent study developing an innovative approach to explore material culture as markers of connectivity and interaction by leveraging the complementary strengths of least cost path analysis and mutual information. Least cost path analysis provides crucial insights into the baseline geographical pathways of trade and exchange that can be compared with mutual information analysis to explore how material distributions deviate from this expected baseline. We apply this method to a case study using the ICRATES dataset of tablewares from the eastern Mediterranean, focusing in particular on the material from late Hellenistic and early Roman times (150 BCE – 50 CE). By exploring the multifaceted factors shaping these distributions across Anatolia and the Levant, this approach will offer a novel methodological approach to enrich our understanding of ancient economies and trade networks, as well as provide further insight into broader questions of (cultural) exchange and power dynamics in these areas.

Polte De Weird[1], Karin Nys[1], Matthias Recke[2]

Old Data, New Horizons: 3D Modeling as a Catalyst for Recontextualizing Fragmentary Legacy Data

[1] Archaeology, Environmental Changes & Geo-Chemistry research group (AMGC), Vrije Universiteit Brussel
[2] Institut für Archäologische Wissenschaften, Goethe-Universität Frankfurt am Main

One of the enduring challenges in digital archaeology is how to bring fragmentary, analog excavation archives into conversation with modern, high-resolution datasets. While photogrammetry and GIS have become standard tools for documenting current excavations, their potential to recontextualize legacy data remains critically underdeveloped. This paper introduces a workflow for embedding heterogeneous archival material into a georeferenced 3D-GIS environment. The approach combines drone-based photogrammetry and ground-controlled 3D models with digitized legacy section drawings and excavation records, which are spatially aligned and corrected within ArcGIS Pro. Rather than treating 3D models as static visualizations, the method positions them as stratigraphic workspaces: environments where legacy profiles can be re-anchored, inconsistencies resolved, and missing contexts interpolated. The workflow addresses recurring technical issues such as elevation mismatches, varying drawing standards, and the absence of metadata. The framework prioritizes interpretative transparency and flexibility, making it suitable for the small-scale, heterogeneous datasets typical of archaeological archives. By demonstrating its application to unpublished excavations at the Late Bronze Age site complex of Hala Sultan Tekke (Cyprus), the paper illustrates how the approach can revitalize fragmented archives, resolve long-standing documentation issues, and generate new interpretative possibilities.

Marta Galindo Díaz[1,2,3]

Ancient Cities, Modern Tools: Quantifying the Environmental Impact of the Roman Bath-Gymnasium at Sagalassos through LCA

[1] Department of Earth & Environmental Sciences, KU Leuven
[2] Department of Archaeology, KU Leuven
[3] Department of Civil Engineering, KU Leuven

During the Roman Imperial period, more cities came about, and most existing ones expanded into larger settlements. Urban monumental architecture was actively promoted. The construction and operation of these buildings relied on the availability and workability of diverse raw materials, including wood, clay

and stone, used both for structural purposes and as energy source. The low efficiency of ancient kilns largely increased fuel requirements and emissions associated with brick, tile and mortar production. Moreover, certain buildings, such as thermae, used vast amounts of wood to heat rooms and water, creating additional pressure on natural resources. Such reliance on wood likely led to environmental challenges, including deforestation-driven erosion, habitat transformation, and air pollution. Today, environmental assessment tools allow us to systematically evaluate the impacts of the construction industry and the usage of urban monuments. Among them, Life Cycle Assessment (LCA) provides a structured framework for quantifying environmental and health impacts across the different life stages of a building. To achieve this, LCA relies on dedicated databases, standardized methods, and specialized software that ensure comparability and robustness of results. But application of these LCA tools to construction and usage of buildings in the past remains unexplored. This study applies LCA to investigate the environmental consequences of constructing and operating the Bath-Gymnasium at Sagalassos during the 1st and 2nd centuries CE. Two established methodologies are employed: IPCC 2021 GWP100 and EN 15804 A2. The analysis highlights the significant role of wood consumption in shaping the building's environmental footprint. Results indicate particularly high impacts in categories such as terrestrial eutrophication, acidification, and land use, underscoring the ecological costs of sustaining large-scale urban infrastructure in antiquity. By adapting modern LCA tools to an ancient context, this research not only sheds light on the environmental impact of Roman urbanism but also demonstrates the value of interdisciplinary approaches in bridging archaeology and sustainability science to investigate aspects such as growth, resource procurement, and potential implications for human health.

Chiara Giovannetti[1,2], Aida Fadioui[1], H. Baran Firat[1]

Humanity-Driven Digital Practices: Placing Human Practices, Bodies and Experiences at the Centre of Data-Driven Endeavours in Archaeology

[1] ARCHES research group, UAntwerpen
[2] Sapienza University of Rome

We have been witnessing an increase in the amount of heritage-related data published online, and in the existing (meta)data standards to structure it. When enabling integration of heritage datasets into the semantic web, such standards allow integrating or linking heritage datasets to broader knowledge graphs, while also facilitating advanced computational analyses and supporting machine learning-driven research and development.
Standards can in theory make our data Findable, Accessible, Interoperable and Reusable, but they can also create a diversity of barriers. In our talk, we elaborate on these barriers and suggest that to support meaningful reuse of heritage-related data, these need to place human experiences more at the centre. Specifically, this means bringing people back into the data, for instance, by finding ways to integrate colors, textures, smells, as well as memories or human practice-based associations. Such perspectives can shape and enrich the heritage-related knowledge-making processes drastically, but we do not yet have the tools to model heritage datasets this way.
Our paper is located at the intersection of three different heritage data modelling research initiatives focused on: enriching archaeological data with insights from children's perspectives, optimising archaeological data reuse for storytelling, and modelling historical soundscapes. We present a functional unit focused on sensory experiences common to our data models and discuss how they contribute to a more meaningful reuse of heritage-related datasets by placing human experiences at the centre of both human- and intelligent machine-led data-driven processes.

Hanneh James[1], Christophe Snoeck[1]

From Baselines to Origins: Quantitative approaches to reconstructing human and animal mobility using strontium isotopes

[1] Archaeology, Environmental Changes & Geo-Chemistry research group (AMGC), Vrije Universiteit Brussel

Strontium isotopes ($^{87}Sr/^{86}Sr$) are commonly applied to trace mobility of archaeological populations. Its effectiveness relies on the fact that $^{87}Sr/^{86}Sr$ differs across a landscape due to differing bedrock geologies and environmental factors, such as sea spray or erosion. This spatial distribution of isotopes across a landscape (termed isoscape) can be modelled using data from modern $^{87}Sr/^{86}Sr$ measurements in a range of materials (plants, soils, water, animals), and using a variety of modelling techniques including Empirical Bayesian Kriging.
This paper uses the Mediterranean island of Corsica as a case study to explore the construction and application of strontium isoscapes. A new baseline has been developed from plant and soil leachate samples collected at 125 sites across the island. These data provide dense coverage across diverse geological and environmental settings, allowing for an evaluation of how lithology, geological age, and proximity to the coast drive $^{87}Sr/^{86}Sr$ variability. The resulting isoscapes highlights areas of both predictability and complexity, illustrating how localised processes can shape isotopic values in ways not immediately visible from broad-scale geology alone. Building on this baseline, the talk will also discuss how probabilistic assignment tools such as assignR can be used to assess human and animal mobility. This includes discussion of how assignment probabilities are generated, how uncertainty is expressed, and how methodological choices influence archaeological interpretation. Examples from Corsica demonstrate both the strengths and the caveats of applying these approaches in archaeologically complex regions.
Ultimately, the case of Corsica underscores both the potential and the limitations of isoscape-based mobility studies, showing that robust baselines depend critically on the quality of environmental data and the accuracy of the landscape variables used to explain $^{87}Sr/^{86}Sr$ variation.

Simon Jaxy[1], Anton Theys[2], Patrick Willett[3], Christopher Carleton[4], Ralf Vandam[3], Pieter Libin[1]

Semi-Supervised Modeling of Archaeological Potential in the Late Antique Sagalassos Area

[1] AI Lab, Department of Computer Science, Vrije Universiteit Brussel
[2] Department of Communications Information Systems and Sensors, Royal Military Academy, Brussels
[3] Archaeology, Environmental Changes & Geo-Chemistry research group (AMGC), Vrije Universiteit Brussel
[4] Max Planck Institute of Geoanthropology

Archaeological predictive modeling (APM) aims to locate undiscovered sites across large landscapes, supporting data-driven cultural heritage preservation (Wang, Shi, and Oguchi 2023). Traditional approaches rely on rule-based or statistical models (Castiello and Tonini 2021; Willett 2022; Yaworsky et al. 2020), but these often fail when site records are sparse or incomplete (Yaworsky et al. 2020). While deep learning offers new opportunities, few, often incomplete site labels and high-dimensional multimodal imagery make models hard to generalize. We propose an end-to-end semi-supervised approach using pseudolabeling to improve prediction of undiscovered sites. Our method is fast, scalable, and demonstrated on satellite imagery from the Sagalassos Study Area (Turkey).
We use Landsat9 imagery (Masek et al. 2020) of the Sagalassos Study Area, Turkey, for the Late Antique period (300–700 CE. Confirmed archaeological site locations provide labeled training points, while the

multispectral imagery supplies high-dimensional input for semi-supervised prediction across the broader landscape. We adopt a mean teacher (MT) framework (Tarvainen and Valpola 2018), where a student network learns from both labeled site locations and pseudolabels generated by a teacher model on unlabeled data. This semi-supervised strategy mitigates sparse training labels and enables extrapolation to unseen areas.
We present a probabilistic prediction map, where the model captures broad landscape patterns while highlighting high-likelihood zones and subtle variations, demonstrating its ability to extrapolate beyond sparse site records. Our semi-supervised mean-teacher pseudolabeling approach demonstrates its effectiveness for archaeological predictive modeling, offering a fast, data-driven solution that handles sparse and incomplete site data. Future work will extend analyses across additional time periods and integrate field validation.

References

Castiello, Maria Elena and Marj Tonini (May 2021). "An Explorative Application of Random Forest Algorithm for Archaeological Predictive Modeling. A Swiss Case Study". In: Journal of Computer Applications in Archaeology 4.1.

Masek, Jeffrey G. et al. (2020). "Landsat 9: Empowering open science and applications through continuity". In: Remote Sensing of Environment 248, p. 111968.

Tarvainen, Antti and Harri Valpola (2018). Mean teachers are better role models: Weight-averaged consistency targets improve semi-supervised deep learning results.

Wang, Yuan, Xiaodan Shi, and Takashi Oguchi (June 2023). "Archaeological Predictive Modeling Using Machine Learning and Statistical Methods for Japan and China". In: ISPRS International Journal of Geo-Information 12.6, p. 238.

Willett, Patrick (2022). Transforming Landscapes of Southwest Anatolia: Modeling Social and Environmental Change from the Middle to Late Holocene Using Predictive Land-use and Cropland Reconstructions.

Yaworsky, Peter M. et al. (Oct. 2020). "Advancing Predictive Modeling in Archaeology: An Evaluation of Regression and Machine Learning Methods on the Grand Staircase-Escalante National Monument". In: PLoS ONE 15.10, e0239424.

Andrei Kedich[1,2], Sarah De Roover[1], Jean Poesen[1,3], Matthias Vanmaercke[1]

Detection of anthropogenic closed depressions in the Belgian Loess Belt and their relationship to archaeological evidence

[1] Department of Earth and Environmental Science, KU Leuven
[2] Archaeology, Environmental Changes & Geo-Chemistry research group (AMGC), Vrije Universiteit Brussel
[3] Faculty of Earth Science and Spatial Management, Maria Curie-Skłodowska University, Lublin

Closed depressions (CDs) are geomorphological features that lie up to a few metres below the surrounding terrain, typically span tens of meters in width, and lack external drainage. These microtopographical forms are characteristic of the European Loess Belt, including central Belgium. Although their origin remains debated, recent research in Western Europe suggests many CDs are anthropogenic, likely resulting from (pre-)Roman quarrying activities aimed at improving soils for agriculture. However, most existing studies rely on systematic field surveys, which limits our understanding of their distribution at the regional scale.
This study addresses this gap by developing a deep learning-based classification framework using

LiDAR-derived elevation data to automate the detection of CDs. Comparable approaches have previously been applied to larger, morphologically similar features such as karst sinkholes.
We developed an automated workflow using 1 m resolution LiDAR-derived topographic data to identify previously undocumented CDs across the central Belgian Loess Belt and to assess their spatial relationship with archaeological finds. A labelled dataset was compiled from earlier field surveys and manual interpretation of terrain hillshade visualizations. Additional CDs were incorporated after manual verification of high-confidence predictions from the initial model run, increasing the number of samples for training, validation, and testing to 500. Classification was performed on fixed-size patches derived from elevation, slope, and hillshade. We employed the state-of-the-art object detection algorithm You Only Look Once (YOLO), based on convolutional neural networks (CNNs), while integrating strategies to address class imbalance.
The best-performing model setup was evaluated on an independent test area and subsequently applied to the full study region. While no significant correlation was found between CD locations and archaeological finds, their distribution suggests a potential link with the former Roman road network.

Emma M. Legrand[1], Hrvoje Potrebica[2], Daria Ložnjak Dizdar[3], Hannah F. James[1], Christophe Snoeck[1]

Understanding human mobility in northern Croatia: Combining strontium isotope analyses and GIS applications

[1] Archaeology, Environmental Changes & Geo-Chemistry research group (AMGC), Vrije Universiteit Brussel
[2] Department of Archaeology, University of Zagreb
[3] Institute of Archaeology, Zagreb

The investigation of mobility in past populations is a popular topic of archaeological studies, and strontium isotope analysis (87Sr/86Sr) has become an established method for the reconstruction of this mobility. The integration of Sr in the human body through the consumption of food, and the common assumption that the food consumed is grown locally, allows for a comparison between a human value and an environmental baseline. This comparison allows the detection of non-locals within the population. The construction of the baseline is therefore crucial, and is done for an area defined as “local” for an archaeological site. However, the extent of this definition can vary depending on site and researcher, and often fails to take into account landscape features that could impact the mobility of the population under investigation, or the suitability of a given area for food production.
This presentation explores how the inclusion of GIS tools, such as cost functions, within the interpretation process of isotopic results can further add to the understanding of mobility in bioarchaeological studies, and refine the interpretations of these results. Here, “locality” is defined according to travel-time from the site. The introduction of variables such as topography, land coverage, or means of transportations can provide a better assessment of the feasibility of movement, and therefore of the area considered as “local”. This helps with the construction of a more accurate baseline. To that end, cost functions using these variables are applied to Croatian sites from the Bronze and Iron Age, to produce isochrones defining the extent of a territory accessible from a site. By combining spatial and bioarchaeological analyses, mobility and landscape use are better understood in a specific environment, and highlight the advantages of the integration of GIS applications for future bioarchaeological studies.

Matthias Lang[1], Philip Verhagen[2]

From PDF to DataFrame: A Pragmatic Workflow for Extracting Roman-Era Archaeological Data from Legacy Reports

[1] Bonn Center for Digital Humanities, Universität Bonn
[2] Vrije Universiteit Amsterdam

A substantial corpus of data on Roman provincial archaeology is documented in serial publications and excavation reports. While fundamental for research, their conventional text format, often only accessible as PDFs, presents a significant challenge for modern, large-scale spatial analysis. This paper introduces a pragmatic computational workflow, designed for implementation in Python environments, to systematically extract and structure this information.
The workflow employs a two-phase analysis. Initially, a structure-aware text extraction preserves the document's layout, which is crucial for identifying geographically distinct sections. These sections are demarcated by parsing location headers (municipalities, districts) via regular expressions cross-referenced with a custom gazetteer. Within each section, the system processes the text to identify and classify archaeological entities. Recognizing the telegraphic style and domain-specific terminology of these reports, the methodology relies on a powerful combination of pattern matching and targeted Named Entity Recognition. The core of this process is a user-curated, hierarchical vocabulary managed in a single YAML file, specifically tailored for Roman-era material culture and features, and developed bilingually (German/Dutch).
The final output is a structured, georeferenced dataset where each entry corresponds to a findspot, attributed with its complete, normalized data (ID, location, classification). The workflow's efficacy is demonstrated through its application to key corpora for the archaeology of the Roman Rhineland: the German Bonner Jahrbücher and the Dutch BKNOB newsletter. The tool generates a geopandas.GeoDataFrame where each row represents a findspot, geometrically referenced and attributed with its complete, normalized dataset. By automating the most time-consuming steps of data compilation, this approach significantly accelerates the creation of research-ready spatial datasets, providing a pragmatic alternative to more complex semantic web frameworks.

Foteini Tsigoni[1]

Negotiation of Cultural Authority: Investigating the social aspects of space through 3D reconstruction of the Frankish Propylaea

[1] Leiden University

This paper investigates how social space was negotiated within the Frankish transformation of the Propylaea's Classical spaces when the monument served as the ducal residence of the de la Roche family? The Propylaea's conversion from Athenian ceremonial gateway to Frankish castle represents a unique case of architectural palimpsest where competing spatial logics—classical processional and medieval hierarchical—intersect within a single structure. Through an interdisciplinary methodology combining space syntax analysis, phenomenological investigation, and 3D reconstruction, this research reveals how medieval occupants adapted monumental classical architecture to establish new forms of social hierarchy and cultural legitimacy. Using space syntax methodology (such as justified network graphs and visibility models), this study maps the transformation of the building's integration patterns, circulation networks and visual relationships, documenting how Frankish modifications created new zones of access control and social differentiation within Mnesicles' original design framework. Space syntax provides quantitative measures of configurational depth and integration, revealing the social logic

encoded in the castle's reconfigured spaces. This analysis bases its hypothesis on a phenomenological foundation that buildings embody social meanings of those who constructed and inhabited them. In other words, space is a lived experience perceived through the body and shaped by culture and at the same time built space influences behavior, allowing us to think that space shapes and frames human values and practices. A 3D reconstruction translates these abstract relations into embodied, experiential models, allowing both iterative testing of hypotheses and visualization of medieval movement through the Propylaea. Space syntax produced a quantifiable data about access, visibility and control while the 3D reconstruction translates those measures into experiential models both visualization and agent based simulations. This synergy provides a critical reflexivity as the reconstruction is not a fixed model but a test environment for hypotheses, revealing how monumental classical space was reconfigured to structure Frankish social life.

Florian Thiery[1]

Bridging Stones and Volcanoes: Can Semantic Modelling, Visualisation, and Little Minions Bridge Archaeology and Geosciences?

[1] Research Squirrel Engineers Network

Semantic modelling, combined with visualisation and documentation workflows, plays a significant role in achieving interoperability and reusability (the 'I' and 'R' of the FAIR principles) by providing the structured, machine-actionable context for cross-domain integration and reuse of data.
This contribution presents an interdisciplinary approach that combines archaeological and geoscientific data within the interdisciplinary federated knowledge graph ecosystem. The focus lies on modelling both artefacts and digital research procedures to support sustainable, transparent, reusable outputs with the help of little minions.
Two data domains form the basis of our case studies: (i) archaeological datasets on Ogham stones, with special attention to fuzzy geoinformation reflecting uncertainty, vagueness, and multiple location hypotheses; and (ii) geoscientific datasets from volcanic tephra deposits, including sites of the Campanian Ignimbrite eruption and other tephra samples from different chronological horizons. These datasets are complemented by semantic descriptions of associated digital procedures, such as 3D documentation workflows for Ogham stones and chemical analyses of geoscientific samples (e.g. EPMA).
Our methodological framework employs Linked Open Data techniques, e.g., GeoSPARQL, and the PROV-O ontology, combined with the fuzzy-sl ontology and Wikibase implementation to capture spatial precision and provenance. A key component in this workflow is the application of lightweight Research FAIRification Tools (RFAIRTs), the Jupyter Python 'little minions', which facilitate querying, visualisation, and analysis of data from distributed knowledge graph sources.
The results demonstrate how semantic modelling and RSE methods within computational archaeology can bridge disciplinary boundaries, linking archaeological and geoscientific datasets in a coherent knowledge graph environment. By integrating diverse datasets through shared ontologies and terminologies, we create FAIR resources that enable advanced spatial analysis, provenance tracking, and cross-domain discovery. This approach illustrates how the combined use of semantic modelling and lightweight RFAIRTs can deliver practical, transferable solutions for managing complex data in archaeology and beyond.

Tuba Ünal[1]

Virtual reconstruction as a tool for presenting historical evolution of archaeological sites: Nysa ad Maeandrum

[1] Middle East Technical University (METU)

With the rapid development of technology, virtual reconstruction as a digital presentation method has become a prominent method in promoting and conserving archaeological heritage sites. However, during virtual reconstruction, the transformations of the site over time and its different historical periods are not accurately conveyed. Instead, the most prominent period of the site is presented as an aesthetic object rather than a scientific communication tool. In this regard, it is important to develop virtual reconstructions that are transparent and scientifically accurate. Distinctions such as which period the elements or sections of the structure belong to, how this information is obtained, and what is current data and what are the assumptions in the modeling process should clearly be differentiated.
This paper explores how virtual reconstruction can be used as an effective scientific communication tool for the presentation of complex historical trajectories of archaeological sites. It focuses on the Library Structure of the ancient city of Nysa ad Meandrum in Türkiye, which reflects the historical evolution of the site that was actively used during the Hellenistic, Roman, and Byzantine periods. The library went under architectural and functional transformations, which served as a church, cemetery, chapel, and other spatial uses in the Late Antique and Byzantine periods. This historical layering provides a strong basis for the digital reconstruction of the building, both in terms of data diversity and in ensuring scientific accuracy. By addressing these aspects, the paper demonstrates how virtual reconstructions can represent the multi-layered and dynamic character of archaeological heritage sites and serve at the same time effective scientific communication tools.

Laura Van der Knaap[1], **Philip Verhagen**[1], **Mark Groenhuijzen**[1]

Connecting demographic agent-based models to skeletal data: the case of the Roman cemetery at Tiel-Passewaaij

[1] Vrije Universiteit Amsterdam

Comparison with the archaeological record is paramount to how we learn from agent-based models (ABM). A variety of archaeological signatures have been used for ABM validation, such as settlement patterns (e.g. Axtell et al. 2002), lithic assemblages (e.g Barton and Riel-Salvatore 2014), and tableware distributions (e.g. Brughmans and Poblome 2016). However, while many ABMs have a demographic component, skeletal data is scarcely used, despite offering valuable information about a population's structure when resulting from normative burial practices (Chamberlain 2009, 276).
This study combines skeletal data and an ABM to gain insight into the (rural) population of the Roman limes. The ABM in question was previously applied by Verhagen and colleagues (2019; 2016) to study the impact of military recruitment, birth control, and disasters on the Limes' population, however, no comparison with the archaeological record was made. This study goes further and uses skeletal data from Tiel-Passewaaij, one of the best excavated rural sites in the Limes region. Special attention is paid to capturing data uncertainty by modelling a 100 potential age-at-death distributions from the skeletal data.
Comparison between the simulated and empirical age-at-death distributions enables us to judge the relative probability of each simulation scenario. Unlike most modelling approaches commonly used in paleodemography, ABM does not shy away from stochasticity or instability of the population. Indeed, some smaller populations' growth and structure do not stabilize even after 200+ years, leading to a

wider range of distributions. Despite this, the best match with the empirical data was obtained under these scenarios with (relatively) low fertility and high mortality, with an average annual population growth of 0.6%. As such, this study shows the potential of combining ABM and skeletal data to examine (demographic and social) processes underlying the cemetery record.

References

Axtell, Robert L, Joshua M Epstein, Jeffrey S Dean, George J Gumerman, Alan C Swedlund, Jason Harburger, Shubha Chakravarty, Ross Hammond, Jon Parker, and Miles Parker. 2002. "Population Growth and Collapse in a Multiagent Model of the Kayenta Anasazi in Long House Valley." Proceedings of the National Academy of Sciences 99 (suppl_3). National Academy of Sciences: 7275–79.

Barton, C Michael, and Julien Riel-Salvatore. 2014. "The Formation of Lithic Assemblages." Journal of Archaeological Science 46. Elsevier: 334–52.

Brughmans, Tom, and Jeroen Poblome. 2016. "MERCURY: An Agent-Based Model of Tableware Trade in the Roman East." Journal of Artificial Societies and Social Simulation 19(1). SimSoc Consortium.

Chamberlain, Andrew. 2009. "Archaeological Demography." Human Biology 81 (2–3): 275–86. doi:10.3378/027.081.0309.

Verhagen, Philip. 2019. "Modelling the Dynamics of Demography in the Dutch Roman Limes Zone: A Revised Model." In Finding the Limits of the Limes: Modelling Demography, Economy and Transport on the Edge of the Roman Empire, edited by Philip Verhagen, Jamie Joyce, and Mark R. Groenhuijzen, 43–59. Cham: Springer International Publishing. doi:10.1007/978-3-030-04576-0_3.

Verhagen, Philip, Jamie Joyce, and Mark Groenhuizen. 2016. "Modelling the Dynamics of Demography in the Dutch Roman Limes Zone." In Multi-, Inter- and Transdisciplinary Research in Landscape Archaeology. VU E-Publishing. doi:10.5463/lac.2014.62.

Dries Vergouwen[1,2], Ann Degraeve[2], Marc Meganck[2], Ralf Vandam[1], Yannick Devos[1]

Visualizing River Histories: A Digital Approach to the Senne Valley in Brussels

[1] Archaeology, Environmental Changes & Geo-Chemistry research group (AMGC), Vrije Universiteit Brussel
[2] Urban.Brussels

The Senne River has long played a central role in the development of Brussels, serving multiple functions throughout history, including the provision of food and water, waste disposal, navigation, and transport. Its banks hosted a wide range of infrastructures such as mills, breweries, fortifications, and fishponds. Over time, the course of the Senne and its tributaries underwent significant transformations, shaped by both natural processes and human interventions in response to the evolving urban landscape. This project seeks to address unresolved questions concerning the evolution of the Senne river valley and broader patterns of human–environment interaction. To this end, a synthesis of archaeological, historical, geological, and environmental datasets has been undertaken and digitized using a range of tools, including QGIS, ArcGIS, and Rockworks. Geospatial data were integrated within QGIS, a 3D reconstruction of the Tours & Taxis site was generated in ArcGIS, and geological information was employed to produce lithological and stratigraphic models for Brussels, using the Rockworks program. Together, these models form the basis of a digital tool designed to enhance understanding of past river dynamics and to support future archaeological research and urban planning within the Senne valley. The presentation will highlight the digital methodologies developed in this project and their potential to provide new insights into the historical evolution of Brussels' riverine landscape.

Alicia Walsh[1]

The Ethical Divide: Critical assessments of digital recording methods in Dutch archaeological practice

[1] Faculty of Archaeology, Leiden University

The ethics of archaeological practice have long been discussed in our field, with topics ranging from collection techniques to organizational codes of conduct, to stewardship of cultural material and treatment of human remains. What ethical archaeology practically looks like has continuously evolved with changing societal values and as archaeology as a discipline matures. The discussion of ethics within digital archaeology is relevantly new, ongoing and highly contextual, and the speed at which technology advances, while being used in fast-paced fieldwork, often leaves little time for critical reflection of its applications and long-term impact. While the collection of digital data using 3D and remote sensing technologies has become increasingly common in daily archaeological research, questioning the social benefits of their use, how to sustainably preserve the data, and enabling accessibility and reuse requires further consideration. By examining what ethics looks like in digital archaeology, we can begin categorizing elements of archaeological practice as ethical considerations, resulting in the notion that archaeologists deal with ethics much more often than may be initially thought; however, there is not always agreement on how to handle these topics. This paper will introduce preliminary findings of qualitative research aimed at archaeologists and cultural heritage professionals in the Netherlands. It identifies usage of these technologies, common challenges encountered with the collection, analysis and archiving of data, varying opinions on the need for standardization, and ethical considerations as they have been encountered within Dutch archaeology.

Wouter Yperman[1]

The 25 year road towards digital field recording

[1] Studiebureau Archeologie

Toen ik in 2001 mijn masterdiploma in de archeologie behaalde, gebeurde veldregistratie eigenlijk volledig analoog. Dat betekende dat iemand alle analoge gegevens moest overzetten naar een digitaal formaat om ze te kunnen verwerken op een computer. Problemen zoals onleesbaar handschrift, slordige tekeningen, vuile papierbladen en een gebrek aan standaardisatie leidde soms tot dataverlies tijdens de transcriptie.
Na mijn studies sloot ik me aan bij een lokale archeologische vereniging (MVSA in Mechelen) en begon ik aan mijn zoektocht naar digitale veldregistratie. Daar experimenteerde ik met een laptop op het terrein en ontwierp ik een ”databank” in AppleWorks. Hieruit rolde ook papieren contextformulieren (omdat een papieren backup nodig was omwille van de beperkte batterij van een laptop). In eerste instantie betekende dit meer aankruisvakjes in plaats van open velden, om vervolgens de algemene contextformulieren aan te passen in functie van de opgraving, tijdens de opgraving. Ook de eerste stappen van de digitale fotografie en digitaal plannen maken zette ik in de MVSA. Voor het maken van plannen en coupetekeningen experimenteerde ik o.a. met Google Sketchup. De digitale fotografie was ook ondertussen volwassen genoeg geworden. Omwille van al deze digitale registraties ontdekte ik het concept van dagelijkse back-ups — een harde les na het verlies van data bij een crash.
In 2006 werd ik voltijds archeoloog binnen de commerciële archeologie. Gemotiveerd door mijn eigen ervaringen bij de MVSA breidde ik mijn digitale experimenten uit. De AppleWorks databank werd omgevormd naar een Filemaker databank. De introductie van een total station en GPS als primair, en voor vele onderzoeken enige, digitale registratie apparaat maakte een analoog plan vaak overbodig.

Ondanks deze vooruitgang bleef volledig digitale veldregistratie buiten bereik. Apparaten zoals smartphones, fieldbooks en laptops hadden hun beperkingen, zeker in de vuile en stroomloze omstandigheden van een opgraving. De introductie van de iPad in 2010 betekende een doorbraak. Ik kocht er meteen één en begon te experimenteren met Het invullen van de databank en het maken van coupetekeningen op de iPad.
In 2011 schakelde het bedrijf waarvoor ik momenteel werk volledig over op digitale veldregistratie. We gebruiken iPads voor contextformulieren, dagrapporten en coupe-tekeningen (FileMaker Go en TouchDraw). De Nikon iSpace vormde de laatste stap in de digitale veldregistratie omdat hierbij complexe sporen (qua vorm en/of opbouw) voor het eerst vlot rechtstreeks digitaal konden worden geregistreerd. Digitale registratie werd een integraal onderdeel van het dagelijkse veldwerk en maakte papierloos archeologisch onderzoek mogelijk. Deze aanpak werd toegepast op alle vormen van archeologisch veldwerk, van proefsleuven tot opgravingen, in landelijke en stedelijke contexten, op eenvoudige en complexe sites, en voor periodes van de prehistorie tot en met de Tweede Wereldoorlog. Nieuwe technologieën zoals drones en fotogrammetrie deden ondertussen hun intrede.
Nu, bijna 25 jaar na het behalen van mijn diploma, ben ik nog steeds een archeoloog binnen de commerciële sector die het digitale pad bewandelt. De FileMaker-database is uitgegroeid tot de ruggengraat van onze projecten. Ze bevat tal van automatiseringen, ”kleine hulpjes” , GIS-achtige integraties en links naar coupe-tekeningen, foto’s, vondsten, locatiegegevens en meer. Ze maakt ook gegevensuitvoer mogelijk voor vondstkaartjes, archeologische depots en rapporten.
De leercurve voor studenten en nieuwe medewerkers is echter steil, maar de meesten omarmen het systeem snel omdat het registratie en rapportage vereenvoudigt zonder dubbel werk of saaie handelingen. Tegelijkertijd wordt het systeem, naarmate het krachtiger en rijker aan functies wordt, ook kwetsbaarder voor fouten in scripts en onverwachte ongewenste gevolgen van sommige aanpassingen. Maar de meer dan 1000 projecten die tot nu toe volledig digitaal werden geregistreerd, zijn het bewijs van een volledig operationeel systeem.
Deze presentatie vertelt het verhaal van het pad dat ik heb afgelegd, de lessen die ik heb geleerd, de fouten die ik heb gemaakt, en de domeinen die nog steeds rijp zijn voor verbetering, ontwikkeling en integratie van nieuwe technologie.