Timetable

Day 1, Friday 10th December	12:50 – 17:00
Introduction and welcome – *Lawrence Shaw*	12:50 – 13:00
SNA and ANT in the study of local identities: central Italian centres and their cemeteries. - *Dr Ulla Rajala*	13:00 – 13:20
Where Was the Water? A Research Project to utilise neural network visual identification classification to aid in the archaeological interpretation of submerged landscapes. - *Dr Andy Fraser*	13:30 – 13:50
Once observed and then forgotten. Are we realising the reuse potential of primary fieldwork and research data? - *Peter McKeague*	14:00 – 14:20
Tea Break	14:30 – 14:45
Credible (and trustworthy) Artificial intelligence in Archaeology - *Daniël P. van Helden, Eliyas Woldegeorgis, Qinghua Zhou, Alexander N. Gorban, Ivan Y.*	14:45 – 15:05
Community building to move forward with FAIR. *Emma Karoune*	15:15: - 15:35
Comfort Break	15:45 – 15:50
Key Note 3D Digitization & publishing: The past, present, & future. *Thomas Flynn*	15:40 – 16:35
AGM	16:55 – 17:10

Day 2, Saturday 11th December	09:00 – 13:00
Panel Discussion: Computer Applications to Climate Change and Heritage. *Chair: Sam Griffiths*	09:00 – 10:00
Comfort Break	10:00 – 10:05
Heritage Discourses and Social Media: Quali-quantitative methods beyond GLAM Environments - *Alex Hiscock* (CAA-UK Graduate Award short list)	10:05 – 10:25
'Heritapp': An interactive heritage smartphone application for tackling the imbalance in cultural visits and promoting citizen participation - *Sonia Pujals Blanch* (CAA-UK Graduate Award short list)	10:35 – 10:55
Inclusive Virtuality - Facilitating Access to Inaccessible Cultural Heritage Sites for the Physically Disabled through an Application of Multi-Sensory Virtual Environments. - *Alastair George Nock* (CAA-UK Graduate Award short list)	11:05 – 11:25
Extrapolation of individual artefact data from in-situ deep-sea archaeological remains; quantitative analysis of a submerged artefact assemblage in the Black Sea. - *Daisy Turnbull* (CAA-UK Graduate Award short list)	11:35 – 11:55
Tea Break	12:05 – 12:15
Key Note Heritage and Nationalism: Understanding populism through big data. *Dr Chiara Bonacchi*	12:15 – 13:00
Close	13:15

Panel Discussion:

Computer Applications to Climate Change and Heritage

Lead: Sam Griffiths (CITiZAN, MOLA)

Panel: Gareth Beale (University of Glasgow), Crystal El Safadi (University of Southampton), Tabitha Kabora (University of York), Phil Murgatroyd (University of Bradford), Nicki Whitehouse (University of Glasgow)

Abstract:

Cultural heritage, as we know, is under constant threat from multiple angles including government led developments & infrastructure to public changes in fashion and tradition (i.e. the intangible). However, arguably the most prevalent and immediate on a global scale is the threat from climate change on heritage, both tangible and intangible alike. We often focus on sea-level rise and the more destructive, visible effects of climate on our coasts. And while these should not be ignored, effects from climate change will need mitigation strategies across the sector, from conserving heritage buildings from extremes in temperature to investigating offshore effects of salinity and acidity or monitoring upland peats regarding drainage/drying out and freak fire events.

This discussion aims to bring some of these issues to the fore with a wide range of expertise and experience from the panel and wider audience. Archaeologists have used a range of computational techniques to approach these questions to relative success but not always whole scale. Some of the key themes involved are not just to look at current methods but also how, as an industry, we present to wider audiences (publics, clients, policy makers etc.). Even within our own industry there are methodologies and practices which could be integrated for solving some of the issues we address daily. The aim of discussion then is to start a process of integration of problems and current practices within computational presentation of climate change and heritage research with a focus for wider audience engagement for future projects, research objectives and developer led archaeological mitigation.

SNA and ANT in the study of local identities: central Italian centres and their cemeteries

Dr Ulla Rajala

Abstract:

In this paper I will discuss the joint use of the Social Network Analysis (SNA) and Agent-Network Theory (ANT) in the study of central Italian centres from the Early Iron Age to the Hellenistic period.

In archaeology the researchers applying SNA and ANT seem to take different kind of approaches: whereas SNA-users interpret the distributions creating graphs and applying different centrality indexes (e.g. Fulminante 2012), ANT-users theorise and conceptualise different kinds of chaîne opératoires, related processes, relevant to their materials (e.g. in van Oyen's (2016) study of the terra sigillata and other Roman pottery productions). I will see how Latour's (2005) constellations can be approached using SNA methods and how this type of reasoning can be compared to inductive research procedure.

I will take a long-term approach to the study of the main cemetery areas in central Italy in order to study identities and mental distances applying network approach. I will look at the tomb types in different communities along the Tyrrhenian and Adriatic Seas and how this category of evidence can act as a proxy in defining identities and socio-political networks.

As part of the theoretical and methodological discussion, I will assess the usefulness of different software meant for the analysis of social networks (Pajek, UCINET and ORA) and consider which one is most user friendly in order to reveal connections across the central Italy. The different aspects of UCINET and ORA functionalities will be discussed.

Where Was the Water? A research project to utilise neural network visual identification classification to aid in the archaeological interpretation of submerged landscapes.

Dr Andy Fraser.

Abstract:

Digital archaeology is expanding in line with the exponential rise in the amount and detail of data now available to researchers (Aycock 2021). Artificial intelligence has enabled many disciplines to reappraise their digital toolkit. However, archaeological use, while ground-breaking (Kramer et al. 2017; Caspari & Crespo 2019; Orengo et al 2020), remains rare.

Our understanding of prehistoric submerged landscapes is predicated on GIS and geophysical interpretation (eg. Gaffney, Thomson & Fitch 2007; Westley et al., 2011, Flores-Aqueveque et al., 2021). Such methodologies require specialised interpretation but ultimately depend on the identification of recurring visual patterns – a task that neural networks have proved adept at.

This research will attempt to utilise a semantic segmentation methodology for a convolutional neural network to aid in the identification of palaeo features within seismic datasets. If successful, more complex leveraging of computer vision is proposed such as the extrapolation of geo-referenced data to determine likely paths of riverine and lacustrine features and even how they might evolve over time.

This is initially a proof-of-concept research project to demonstrate the utility of computer vision in the archaeological interpretation of seismic data, achievable within twelve months. It aims to show potential for more complex and useful implementations in the future. Therefore, one of the first tests of the network will be to support or disprove several recent papers which propose locations of ice-dammed lakes in the southern North Sea post the Last Glacial Maximum (Törnqvist & Hijma 2012; Sejrup et al 2016; Hjelstuen 2018; Emery 2019). Not all of these proposed locations can be true, but can a machine learning application tell us where the water was?

Once observed and then forgotten. Are we realising the reuse potential of primary fieldwork and research data?

Peter McKeague

Abstract:

Every year archaeologists create a wealth of primary data from fieldwork and research—unique observations and irreplaceable records of the past. Most of this data is either born digital or manipulated digitally during analysis and report production.

Despite considerable investment in data collection, documenting the geographical location, extent, characteristics and relationships between data, resulting in a project report, the long-term potential of that data to contribute to the wider archaeological landscape remains largely unrealised.

Barriers to reuse include the format of the data, all too often the only accessible data is an image of the survey results fossilised in the pages of a PDF. Although the images can be extracted and georeferenced into a GIS, the primary data remains with the project archive which may or may not be publicly accessible. Even where the data is available from an archive, the attribution may be internally consistent but, without agreed standards, requires considerable effort to harmonise within a GIS. Challenges of combining data from different survey techniques (field survey, airborne mapping and LiDAR data) to maximise the use and reuse of that data are discussed in the context of FAIR Data Principles. Accessing and reusing GIS data will be explored further through the SEADDA (Saving European Archaeology from the Digital Dark Ages) COST Action during 2022.

Credible (and trustworthy) Artificial intelligence in Archaeology.

Daniël P. van Helden, Eliyas Woldegeorgis, Qinghua Zhou, Alexander N. Gorban, Ivan Y. Tyukin, Penelope M. Allison

Abstract:

The black box nature of Artificial Intelligence tools can be a hindrance to their acceptance and implementation in archaeology. If people do not know what goes on

'under the hood', it is difficult to trust the results that the machine produces. Whereas traditional statistics offered at least the nominal option of checking the calculations and seeing why certain patterns have arisen, with AI tools built within the agnostic framework of machine learning, whereby we intentionally do not (or sometimes simply may not be able to) provide the algorithms with full information about data distributions, we have little choice but to accept what the machine throws up. Such blind acceptance is at odds with academic rigour, which demands the tools that we use to explain the world can, at least in principle, be understood.

The subfield of explainable AI seeks to make improvements to this situation by providing insights into elements of the inner working of the machine. In image classification, a range of approaches is being developed to make Convolutional Neural Networks more understandable by highlighting which elements of an image the classifier is looking at when it is labelling that image.

This paper will showcase work in progress in the Arch-I-Scan project with such explainable AI. Using examples from this project we will argue that explainable AI not only has potential to improve implementation of AI technology in archaeology, by expanding trust through elucidation, but also to help development of specific AI tools through the creation of error correctors and targeted synthetic training data.

Community Building to move forward with FAIR.

Emma Karoune

Abstract:
Our project 'Increasing the FAIRness of phytolith data', funded by EOSC-Life, is starting from the very beginning of implementing the FAIR principles. We are taking an open-source community-led approach to build-in training in computational skills and data management for our community so that all researchers move along this journey with us.
Phytoliths are microscopic plant remains used to answer questions about human plant use, environmental change and plant physiology in archaeological, palaeoecological and botanical research. The phytolith community has started to standardise data

through the development of a common nomenclature and other guidelines (Madella et al. 2005, Neumann et al. 2019, Portillo et al. 2020, Zurro et al. 2016). However, the routine adoption of these standards is still not straightforward.

Data sharing is minimal and often still shared within paywalled published articles rather than in open repositories. An assessment of open science practices in phytolith research (Karoune 2020) found only a small percentage of reusable data. These results, and the need to raise awareness of the benefits of wider data sharing, initiated this project to take the first steps along the FAIRification journey.

Our FAIRification approach:

- Community survey - about current data sharing practices to gain a better insight into the current barriers and training needs.
- Open-source project - fully accessible and we are inviting contributors to work with us. This will hopefully lead to greater implementation of our outputs by researchers.
- FAIR data assessment - exploring existing phytolith data from published articles with a fully reproducible workflow. We will be working with researchers whose data is within our dataset to train them in FAIRifying phytolith data. This work can then be used to develop tools for FAIR assessment and model best practice for the rest of our community.

We understand this work cannot be completed without consensus in the phytolith community therefore this approach will be used to build a collaborative strategy to move forward with the FAIRification of phytolith data.

3D Digitization & publishing: The past, present, & future.

Thomas Flynn

Abstract:

Sketchfab is a community platform for publishing and finding interactive 3D models with a community of over 6 million members. Since 2015, Sketchfab has operated a support programme for cultural & heritage projects which thousands of galleries, libraries, archives, museums (GLAM organisations) have taken advantage of our platform to begin sharing historic content online in 3D. This presentation will share insights and

observations gleaned from years of working directly with global cultural organisations, examples of how 3D has been leveraged by organisations during the global pandemic, and a glimpse at what the future holds for the industry.

Day 2 Abstracts

Heritage Discourses and Social Media: Quali-quantitative methods beyond GLAM Environments.

Alex Hiscock

Abstract:

Digital heritage has received extensive study since the 1990s with ever-expanding usership and capabilities of new-media and digital environments. Though the technology has developed extensively, study in this area has often remained grounded in a perspective focussing on how digital technologies may be marshalled by galleries, libraries, archives and museums (GLAMs) to engage and disseminate knowledge amongst as wide an audience as possible.

It is argued here that to fully understand the contemporary processes behind heritage development and mediation in globalised digital spaces, theory and research must target relationships between popular infrastructures of exchange and user-behaviours as they develop around them.

Focussing on User Interfaces (UIs), this paper pilots a multi-content approach tracking a single data subject as it was disseminated across numerous public infrastructures. In integrating computer intensive quali-quantitative methodologies, this research targets discoursal processes as they developed over the global, public internet. The application of this approach enabled the shifting relationship between popular online infrastructures of meaning-exchange and other discoursal actors to be discerned, and the plural and divergent discourses of authority and identity that dictate current online-communal heritage formation to be recognised.

Developing 'Heritapp':An interactive heritage smartphone application for tackling the imbalance in cultural visits and promoting citizen participation.

Sonia Pujals Blanch

Abstract:

Cultural heritage ranges from the tangible to the intangible, from traditions and practices to monuments, landscapes, and artefacts of our day-to-day life. Currently, multiple processes affect and potentially threaten cultural heritage and impact society at the level of self-conception and identity of the individual. The present paper centres around the development of Heritapp, a new heritage smartphone application. Addressing the challenges from the specific field of heritage sites, Heritapp pursues to identify and provide solutions to the main problems the heritage sector faces. Specifically, this native application aims to balance cultural visits while promoting public engagement with heritage professionals. Tackling these issues is the first step in achieving sustainable tourism, a form of tourism that meets visitors' needs to cultural sites, the tourism industry, and host communities without compromising the environment and preserving heritage landscapes for future generations. The multidisciplinary approach of Heritapp has grounded on gamification strategies, positive reinforcement psychology, and consumer behaviour studies. This theoretical basis has underpinned the user-centred design of Heritapp. In this regard, the disciplines mentioned above seek to devise a smartphone application for cultural visits that makes a difference in the heritage sector.

Inclusive Virtuality - Facilitating Access to Inaccessible Cultural Heritage Sites for the Physically Disabled through an Application of Multi-Sensory Virtual Environment.

Alastair George Nock.

Abstract:

The research project aimed to investigate how an inclusive and multi-sensory Virtual Environment could facilitate access to an inaccessible cultural heritage site for a user with physical disabilities. This was achieved via the development of a Virtual Reality experience, whereby the Virtual Environment included several accessibility features to address the needs of a user with physical disabilities. The research project placed an emphasis on accessibility, scalability, and reproducibility, however the conclusions from an analysis of relevant literature and current research trends suggested that the development of a multi-sensory Virtual Reality experience would have contradicted these design decisions by requiring technology that was inaccessible and unaffordable. The Virtual Reality experience was therefore developed as an audio-visual Virtual Reality mobile application, whereby the inclusion of accessibility features was prioritised over multi-sensory stimulation. By adhering to the principles that are defined within the London Charter, the research project succeeded in developing a reproducible template that could be applied to archaeological data to produce a similar digital representation that would address the needs of a user with physical disabilities whilst retaining archaeological authenticity. The research project concluded that such a Virtual Reality experience could make the digital representation of a cultural heritage site accessible to a user with physical disabilities, however such a Virtual Reality experience may benefit from a reduced illusion of presence and reduced sensory stimulation to mitigate cybersickness.

Extrapolation of individual artefact data from in-situ deep-sea archaeological remains; quantitative analysis of a submerged artefact assemblage in the Black Sea.

Daisy Turnbull

Abstract:

The remains of a recently discovered Late Roman trading vessel in the Black Sea, designated as 'BSMAP_2017_WRECK_008' or 'Sinemorets A', has offered an opportunity to implement new digital approaches to in-situ artefact analysis in a deep-sea setting,

through the extrapolation of data from high-resolution multi-source photogrammetry modelling. Original data was retrieved using state-of-the-art WROV systems by the Black Sea Maritime Archaeology Project (BSMAP) in 2017. Recent analysis undertaken as part of Masters degree research at the University of Southampton, has remotely studied the remains of individual ceramic artifacts found within the wrecks assemblage; undertaking quantitative analysis of the 81 ceramic vessels associated with a decked structure in the fore of the wreck in a digital investigation into the 'lost cargo' of this Late Roman trading vessel. This paper reviews the employment of computational artefact analysis and the implementation of digital humanities techniques in the investigation of 'Sinemorets A' wreck, that draws it into a wider narrative of trade and connection between the Black Sea and the Mediterranean in Late Antiquity. This paper invites wider discussion on the implementation of digital analysis and the research opportunities created for remote investigation of deep-sea shipwrecks and further explores the significance of computational archaeological study in the assessment and analysis of submerged archaeological sites as new standards for deep-water investigation develop.

Key Note

Heritage and Nationalism: Understanding populism through big data.
Dr Chiara Bonacchi

Abstract:

This lecture draws on the results of an extensive programme of research involving both data-intensive and qualitative methods to investigate how the Iron Age, Roman and Early Medieval past of Britain and Europe are leveraged to support or oppose populist nationalist arguments as part of social media discussions concerning Brexit, the Italian Election of 2018 and the US-Mexican border debate in the US. Analysing 60 million tweets and Facebook posts, comments and replies, this research, due to be published as a book with UCL Press, is the first to use big data to answer questions about public engagement with the past and identity politics.