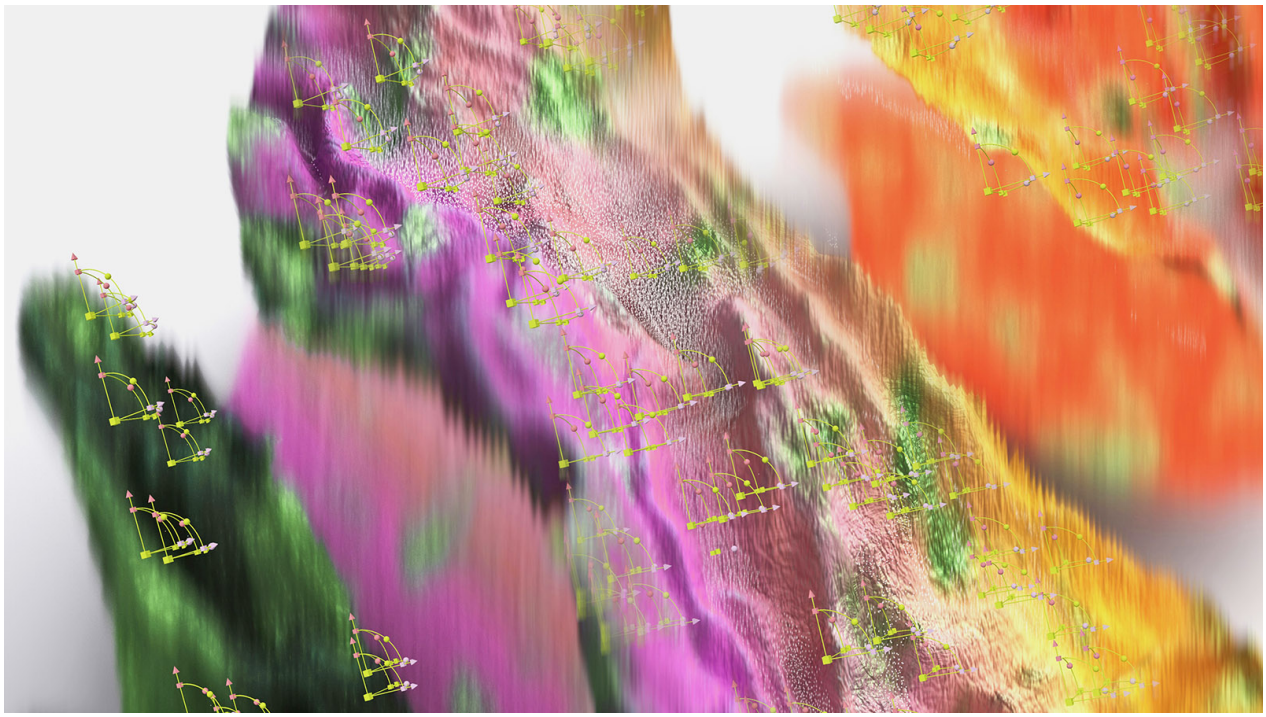
De/coding Digital Archaeology Symposium

Full Program

29 November 2024, University of Melbourne



Explore the intersection of archaeology and emerging data analytics methods, examine the evolving relationship between the physical and digital and gain insights into the increasingly interdisciplinary nature of digital archaeology.

This symposium brings together University of Melbourne scholars from diverse fields to share their work on data-driven approaches to investigating the past. The symposium will showcase projects that use a variety of data practices, digital tools, computational methods, and analytical techniques.

Speakers will discuss how innovative data-driven methodologies contribute to expanding the frontiers of digital archaeology. Discover new avenues of archaeological inquiry that apply to individual artefacts as well as broad cultural landscapes. Topics include digital preservation of cultural heritage, critical reflections on technology's impact, ethics and interpretation, novel digital methods, and the role of AI and advanced computational techniques.

Hosted by the Melbourne Data Analytics Platform and the Australasian chapter of Computer Applications and Quantitative Methods in Archaeology.

Program

Time	Session
9.30am - 10am	Morning tea and welcome
10am - 10.30am	**Welcome remarks** Aleks Michalewicz, Senior Research Data Specialist (MDAP) and Digital Research Academic Convenor, University of Melbourne & CAA Australasia exec Josh Emmitt, Chair, CAA Australasia & Archaeology Curator, Auckland War Memorial Museum,Tāmaki Paenga Hira **Opening speaker** Levi Murray (Hubble), Strategic Manager of Indigenous Data, Indigenous Studies Unit, Melbourne School of Population and Global Health, University of Melbourne
10.30am - 12pm	**Session 1** *Storying Indigenous engineering ingenuity in the aquaculture systems of the Gunditjmara at the UNESCO World Heritage Budj Bim cultural landscape* Tyson Lovett-Murray, Bill Bell, Adam Black, Evelyn Nicholson, Gabriele Marini, Brian Armstrong, Aleks Michalewicz, Andrew Mahisa Halim, Amanda Belton, Juliana Prpic, Martin Tomko *These are a few of my favourite things: An eclectic discussion of 3D modelling in Victoria and abroad* Tom Keep *Digital dental data from the centre of Melbourne* Rita Hardiman
12pm - 1pm	Lunch - free time
1pm - 2.30pm	**Session 2** *Allowing for multiple assessments, or datasets, for a single object* Karen M Thompson *A historians approach to data analytics* Emily Fitzgerald *Old problems, new machines: Best and big data in archaeology* Michelle Richards

2.30pm - 2.45pm	Afternoon tea
2.45pm - 3.45pm	**Session 3** 2.45pm - 3.15pm *'AncientNLP': A cross-discipline collaboration harnessing natural language processing in ancient script research* Kabir Manandhar Shrestha, Emily Tour, Robert Turnbull, Brent Davis, Kim Doyle 3.15pm - 3.45pm *The LLM Livy* Robert Turnbull, Emily Fitzgerald, Nicolo Fabila, Giulia Torello-Hill and Andrew Turner
4.15pm	Discussion and drinks (in person) Join us for informal drinks and celebration at the The Queensberry Hotel, 593 Swanston St, Carlton VIC 3053.

Opening speaker

Levi Murray (Hubble) from the Indigenous Data Network at the University of Melbourne presents at the HASS Computational Summer School. Credit: Renee Nowytarger / ARDC

Levi Murray (Hubble) is an Aboriginal man of Wakka Wakka and Kubi Kubi descent. He is a seasoned health strategist and academic specialist with over 16 years of cross-sector experience in public health and education.

In April 2022, Levi was appointed as the Strategic Manager of Indigenous Data with the Indigenous Studies Unit at the Melbourne School of Population and Global Health, where he oversees the HASS Research Data Commons and the Indigenous Research Capability Project.

Session abstracts and speaker bios

Session	Speakers	Abstract	Bio
Storying Indigenous engineering ingenuity in the aquaculture systems of the Gunditjmara at the UNESCO World Heritage Budj Bim cultural landscape	Tyson Lovett-Murray, Bill Bell, Adam Black, Evelyn Nicholson, Gabriele Marini, Brian Armstrong, Aleks Michalewicz, Andrew Mahisa Halim, Amanda Belton, Juliana Prpic, Martin Tomko	The Budj Bim Cultural Landscape, a UNESCO World Heritage site in western Victoria, Australia, lies within the traditional Country of the Gunditjmara. The landscape is characterised by volcanic geology shaped into unique ancient aquaculture systems dated to at least c.6600 cal BP. These complex systems showcase the Gunditjmara's engineering prowess. A collaboration between the Gunditj Mirring Traditional Owners Aboriginal Corporation (GMTOAC) and researchers at the University of Melbourne utilized high-resolution LiDAR data and the Unity game engine to create realistic simulations of water flows through the systems. The project, guided by Gunditjmara priorities and knowledge, employed an iterative methodology, incorporating local knowledge to enrich the visual narrative of flooding on Gunditjmara Country. This approach led to the identification of new sites and insights into the seasonal and cyclical nature of the systems. The interdisciplinary research, underpinned by a philosophy of regenerative design, supports the Gunditjmara in reviving cultural knowledge of their Country.	Since 2017, the Faculty of Engineering and Information Technology (FEIT) at the University of Melbourne has collaborated with the Gunditj Mirring Traditional Owner Aboriginal Corporation (GMTOAC) in both on-Country learning and research. This partnership brings together Gunditjmara Elders, Rangers, Knowledge-holders and a multidisciplinary academic team drawing on archaeology, geo-spatial engineering, lidar processing, Digital Elevation Modelling, machine learning, and immersive visualisation technologies and Indigenous storytelling to deepen understanding of the ancient aquaculture systems at the Budj Bim UNESCO World Heritage Cultural Landscape.

These are a few of my favourite things: An eclectic discussion of 3D modelling in Victoria and abroad	Tom Keep	3D modelling is becoming more commonplace in archaeological practice both internationally and within Australia yet is still dismissed by some as another phase of 'pretty pictures'. In many cases, this is true; but there is a wealth of possibility for 3D modelling of archaeological heritage when it is used effectively and purposefully. This presentation will discuss the author's experience as a 3D modelling specialist working on the Plain of Gioia Tauro Survey Project and Marzuolo Archaeological Project in Italy, using enhancement techniques for Indigenous Australian rock art in the Grampians, and working with the University of Melbourne to produce and manage 3D models of the university's cultural material collections. It will provide a brief overview of applications of aerial and terrestrial photogrammetry, handheld LiDAR, decorrelation stretch enhancement, and photometric stereo imaging among other techniques, and the need for careful data management.	**Tom Keep** is an archaeologist and PhD candidate at the University of Melbourne working with 3D modelling of heritage. His research explores the potential of virtual reality displays of reconstructed rural heritage as a mode of preservation, public engagement, and education. He has worked for three seasons as the 3D modelling specialist on the Marzuolo Archaeological Project, and since 2023 as the Digital Resource and Research Support Officer at the University of Melbourne.
Digital dental data from the centre of Melbourne	Rita Hardiman	As part of Melbourne's Big Build Metro Tunnel project, several archaeological investigations were carried out at sites marked construction access. One of these sites, on Swanston Street in Melbourne's CBD, revealed over 2500 extracted human teeth during the dig. This project draws on the wealth of information collected from the teeth during cataloguing works. Data included categories such as disease state of the teeth, staining, wear, morphological variation and tooth type. The teeth originated from two clinics operating on the same block in the late 1880s to the 1920s. Using the digital data recorded about the teeth, differences in patient cohorts and clinic activities can be discerned by sophisticated analysis techniques. Further investigations involved digital volumetric scanning to produce case studies of individual teeth and related information about the individual.	Associate Professor **Rita Hardiman** is an anatomist with a research interest in mineralised tissues, and information they can provide about the environment, activities, development and health of individuals. Rita's research has centred around cortical bone, teeth and dental calculus. She uses imaging techniques in her work and is also interested in the non-destructive nature of digital representations of physical samples to enable future investigations.

Allowing for multiple assessments, or datasets, for a single object	Karen M Thompson	Khipus continue to evade full decipherment. Over the last century or more, scholars have shared the data they have collected from/about these archaeological objects in the hope of accelerating understanding. What each considered worth measuring and noting has evolved over the decades. Available data is now held in an open-access database, which has a structure general enough to accommodate all features of interest. However, only the most recent assessment of a khipu is held in the database. Yet, comparing a handful of multiple assessments - retrieved from both the database and published print material - shows that assessors can make mistakes. This means that the data in the database, as 'official' as it may appear, may not be representative of the actual object. The impact of this data collection (and storage) methodology, particularly on data-driven analyses, must be interrogated.	**Karen M Thompson** is a Senior Research Data Specialist with a passion for data organisation, communication, and working at the intersection of data and cultural collections. She was an actuary for more than two decades, has a Bachelor of Fine Arts (2006) and a Masters in Cultural Materials Conservation (2019). Karen is a Khipu Field Guide research Affiliate.
A Historians approach to data analytics	Emily Fitzgerald	When researchers work on interdisciplinary or cross-disciplinary research projects, or even when they change disciplines altogether, the training and methodology of their original discipline can still shape new approaches. This paper explores how training as a historian and historical methodology influences and shapes her approaches to data, whether examining existing datasets or creating new ones.	**Emily Fitzgerald** is a Historian and Research Data Specialist in the Melbourne Data Analytics Platform (MDAP) at the University of Melbourne, where she has worked on several archaeology based collaborations. Her PhD in transnational history fostered an interest in the digital humanities, where she has a particular affection for digging into the data, be it data cleaning or data analysis. She is keenly interested in what technological tools and skills can bring to humanities research and what humanities scholars can bring to technological development.

Old problems, new machines: Best and big data in archaeology	Michelle Richards	Despite new technological advances in analytical instrumentation building relevant regional databases for archaeological research remains a current issue. The availability of big data and machine learning or AI is a promising, yet daunting, solution. Improvements to databases are also required ensure the progress and new discoveries made remain accessible to communities and researchers in the future. My research revisits old museum collections and previously overlooked ethnographic collections from Australia and the Pacific with archeological science and First Nations communities. Through this collaborative work aspirations for Indigenous data sovereignty also emerge as an important avenue to building enduring cultural heritage databases.	**Michelle Richard**'s innovative research combines archaeological and earth science approaches with heritage and museum studies. She has been working at the forefront of the development and application of non-destructive geochemical analysis to identify and characterise the origin of archaeological stone tools as a means to explore historical complexities and interactions among First Nations peoples and early settler communities.
'AncientNLP': A cross-discipline collaboration harnessing natural language processing in ancient script research	Kabir Manandhar Shrestha, Emily Tour, Robert Turnbull, Brent Davis, Kim Doyle	AncientNLP is a collaborative project between MDAP data specialists and researchers from Classics & Archaeology at UniMelb that addresses the growing need for computational tools in ancient text research. By leveraging natural language processing techniques, we have been developing a number of resources for analysing both deciphered and undeciphered scripts and their underlying languages, including ancient Greek, Latin, Akkadian, Syriac, Etruscan, Hittite, and Linear A and B. This interdisciplinary initiative aims to bridge the gap between traditional philological methods and modern computational approaches. The project has produced two significant open-source contributions: 'Ancient Corpora', a comprehensive pipeline for generating structured training, validation, and testing datasets, and 'Potnia', a Python library that converts Romanised transliterations of texts to Unicode representations. These tools enable various downstream	**Kabir Manandhar Shrestha** is a Research Data Specialist at the Melbourne Data Analytics Platform, where he specializes in developing machine learning (ML) solutions and natural language processing (NLP) applications for interdisciplinary research. His expertise lies in designing and implementing end-to-end ML pipelines, from data preparation to model deployment. He regularly works with both traditional ML frameworks and modern deep learning architectures, particularly in NLP applications. **Emily Tour** (she/they) is an archaeologist and PhD student at the University of Melbourne. Their doctoral research focuses on the study of Bronze Age Aegean

		tasks, including text reconstruction, semantic analysis, and machine translation. We demonstrate their effectiveness through a detailed analysis of Linear B logograms, showcasing how computational methods can enhance our understanding of ancient writing systems. These outcomes provide a framework for future computational research in ancient scripts and languages and highlight the growing potential of digital approaches.	administrative documents; in particular, the application of digital methods such as 3D modelling, shape analysis and phylogenetics to better understand these artefacts. Emily currently volunteers at the Australian Institute of Archaeology, where they are assisting with the ongoing digitisation of the museum's collection. They are also an ongoing participant in the Kaymakçı Archaeological Project in western Türkiye.
The LLM Livy	Robert Turnbull, Emily Fitzgerald, Nicolo Fabila, Giulia Torello-Hill and Andrew Turner	Ab Urbe Condita by Livy (59 BCE–17CE) is one of the most comprehensive accounts of Roman history in the first millennium BCE. Though much of Livy's text is lost, surviving manuscripts preserve about a quarter of his monumental work. This project explores the manuscript transmission of the first five books of Livy, covering the mythical origins of Rome until its sack of 387 BCE. We have digitised the apparatus of textual variants edited by Robert Conway and Charles Walters and published by the Oxford University Press in 1914. This was achieved by using a multimodal large language model (LLM) pipeline to transcribe the text of the apparatus into markdown format. Then the textual variants were converted to Text Encoding Initiative (TEI) using another LLM pipeline. This encoding allowed us to perform a phylogenetic analysis of the textual variants, showing how the surviving manuscripts are related.	**Robert Turnbull** previously worked for Monash Cluster Computing where he was responsible for developing the Geodynamics modelling program Underworld. In 2020, he completed his PhD using Bayesian phylogenetics to study the transmission history of Arabic manuscript texts from the Middle Ages. Robert is now a Senior Research Data Specialist at the Melbourne Data Analytics Platform where he collaborates with researchers across the University of Melbourne in data intensive research projects. During this time Robert has developed Deep Learning models which have won international academic competitions in reading Greek papyri and interpreting medical imaging. **Andrew Turner** is a lecturer in the School of Historical and Philosophical Studies. His research focuses on the reception of

			Classical Latin literature in the Middle Ages and Renaissance. He has published extensively with Giulia Torello-Hill on Terence (their last volume, *The Lyon Terence*, appeared in 2020), and also works with Professor Bernard Muir, and with him is preparing a volume on Seneca commentaries. In 2023 he was awarded an MDAP grant to work on a commentary on Livy.