SunoikisisDC Spring 2026
Session 3

3D Modelling and Visualisation

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Outline

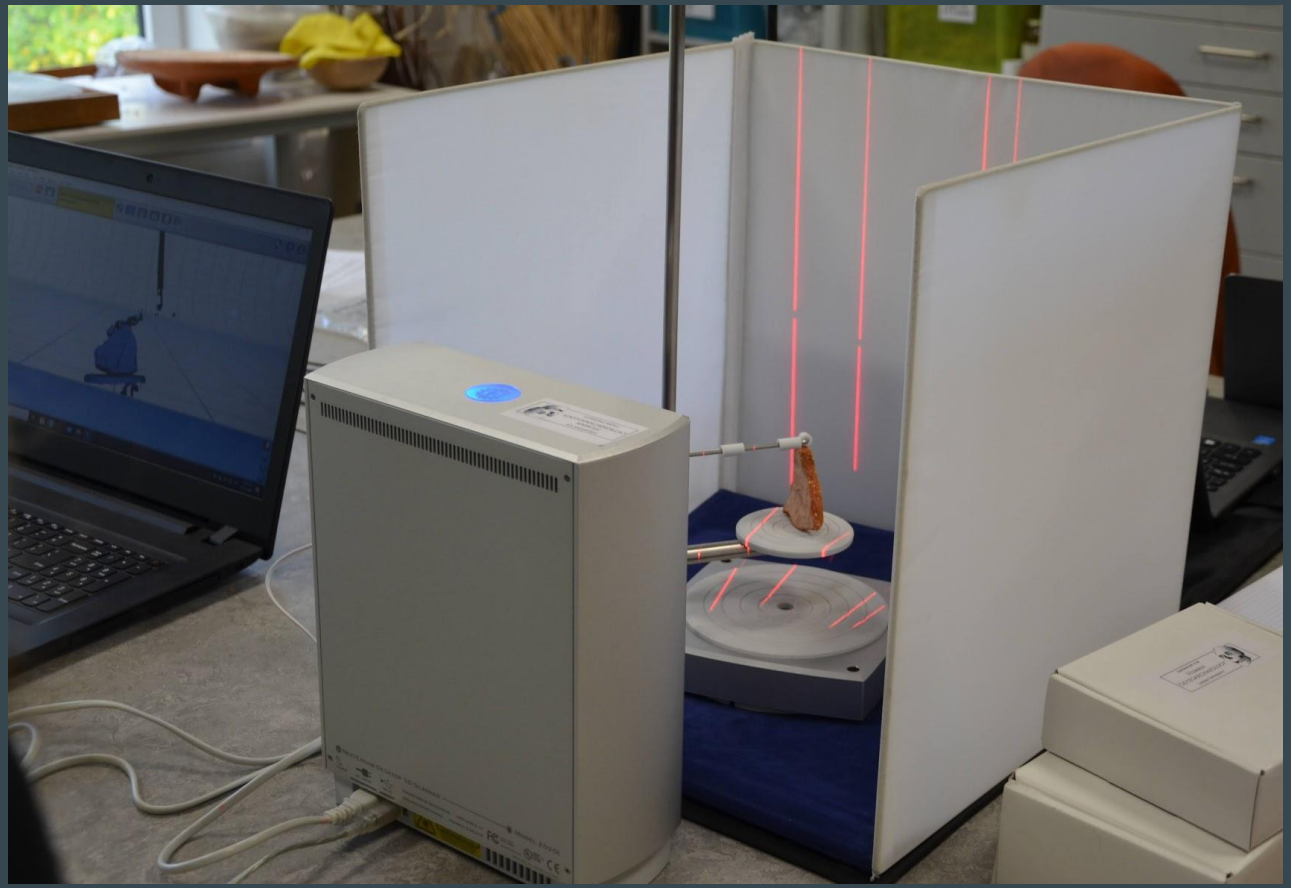
1. Introduction
2. Case study 1: Dean Hall Temple
3. Theoretical introduction
4. Case study 2: Messing with Meshes
5. Case study 3: Ekklestiasterion of Iseum in Pompeii
6. Exercise and discussion

Introduction to 3D Methods

Introduction to 3D Methods

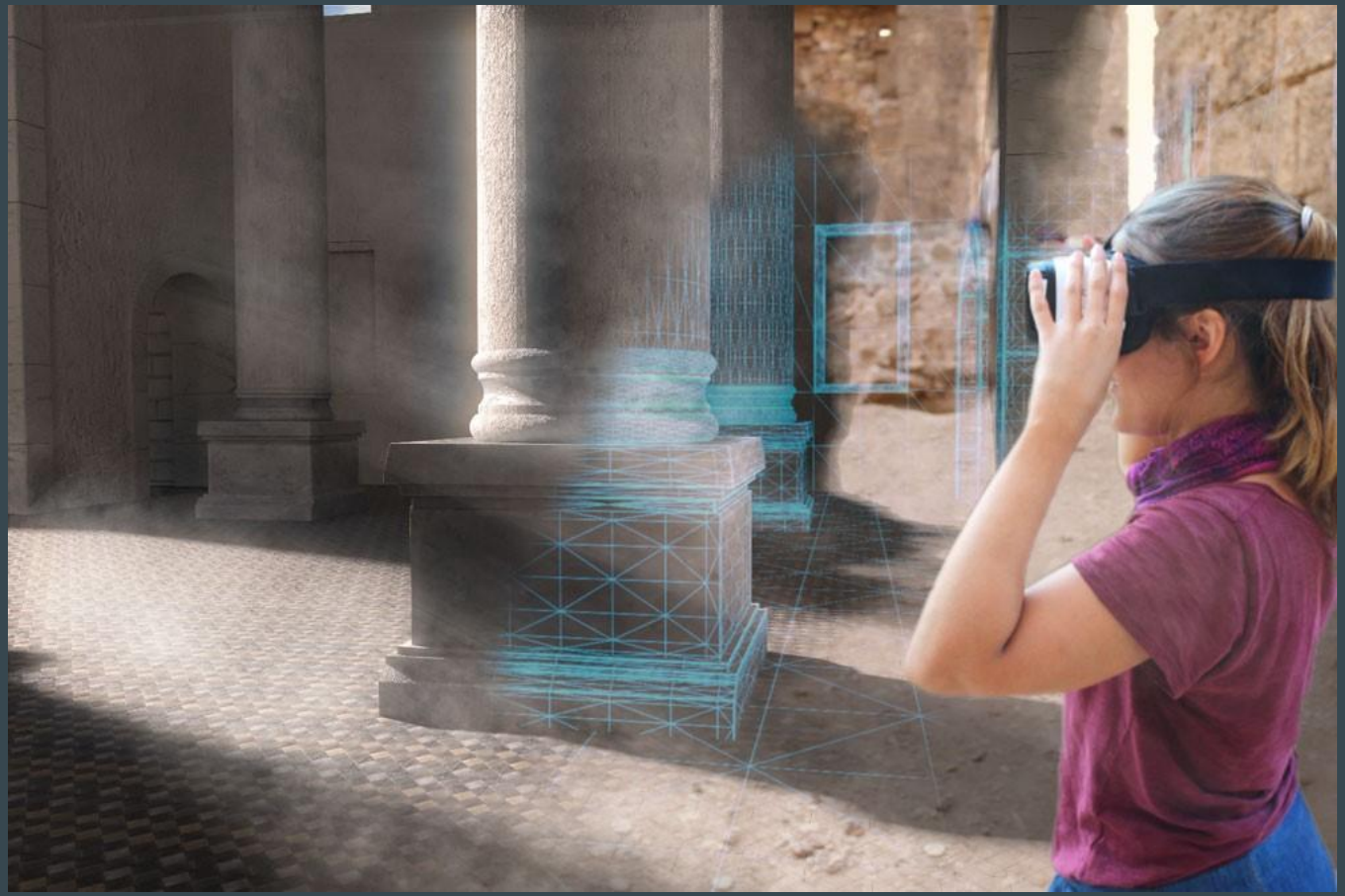
1. 3D imaging or scanning
2. 3D modelling/reconstruction/visualization
3. Virtual Reality (VR)
4. Augmented Reality (AR)
5. Distribution of 3D models

1. 3D imaging or scanning

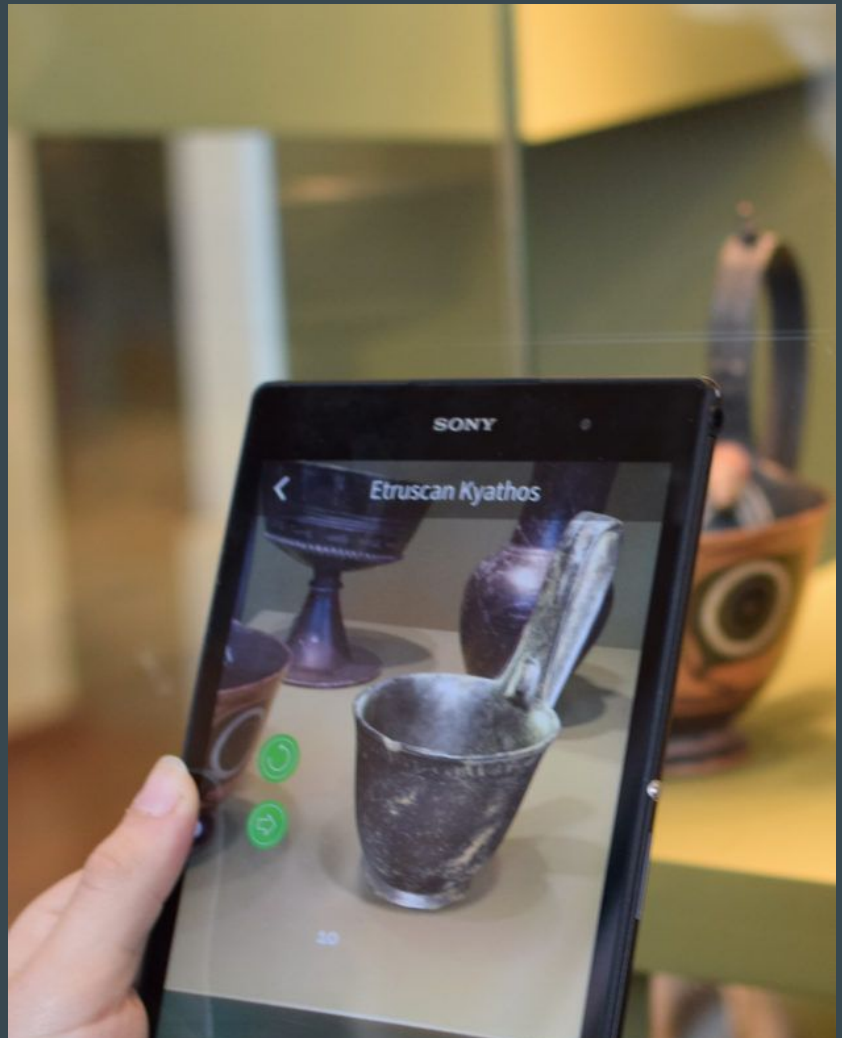


2. 3D modelling/reconstruction/visualization

3. Virtual Reality (VR)

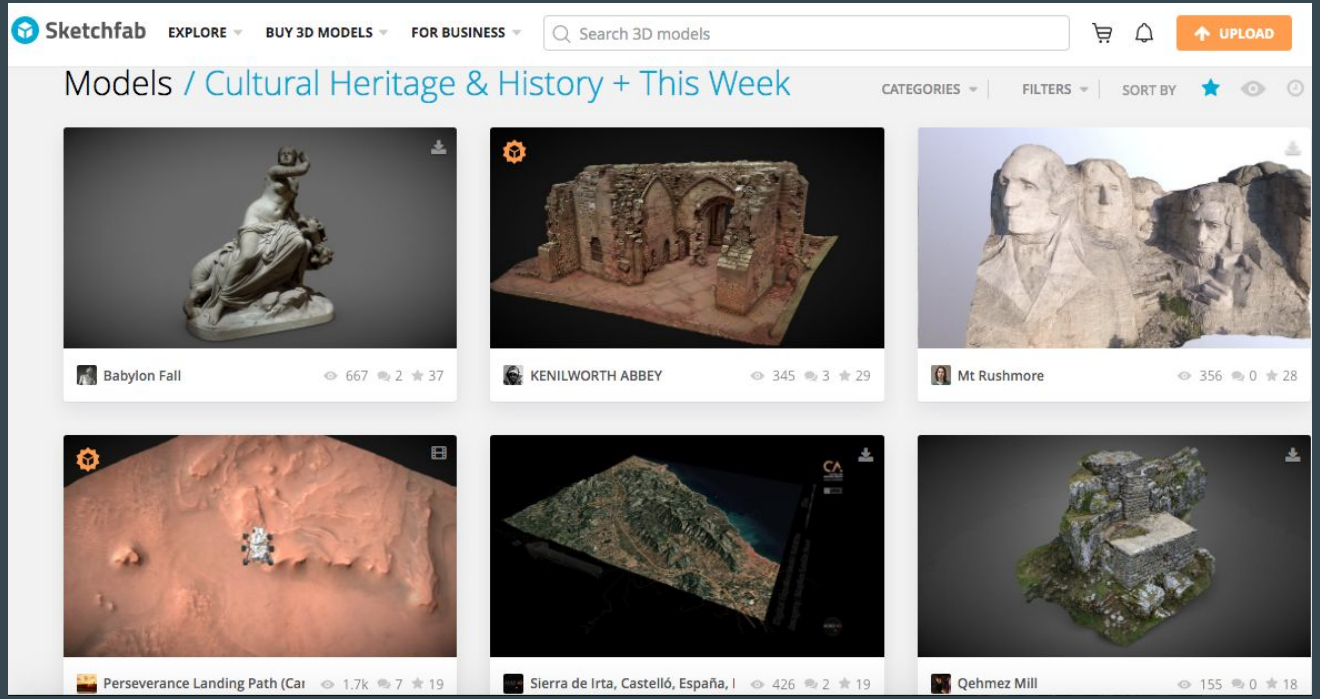


4. Augmented Reality (AR)

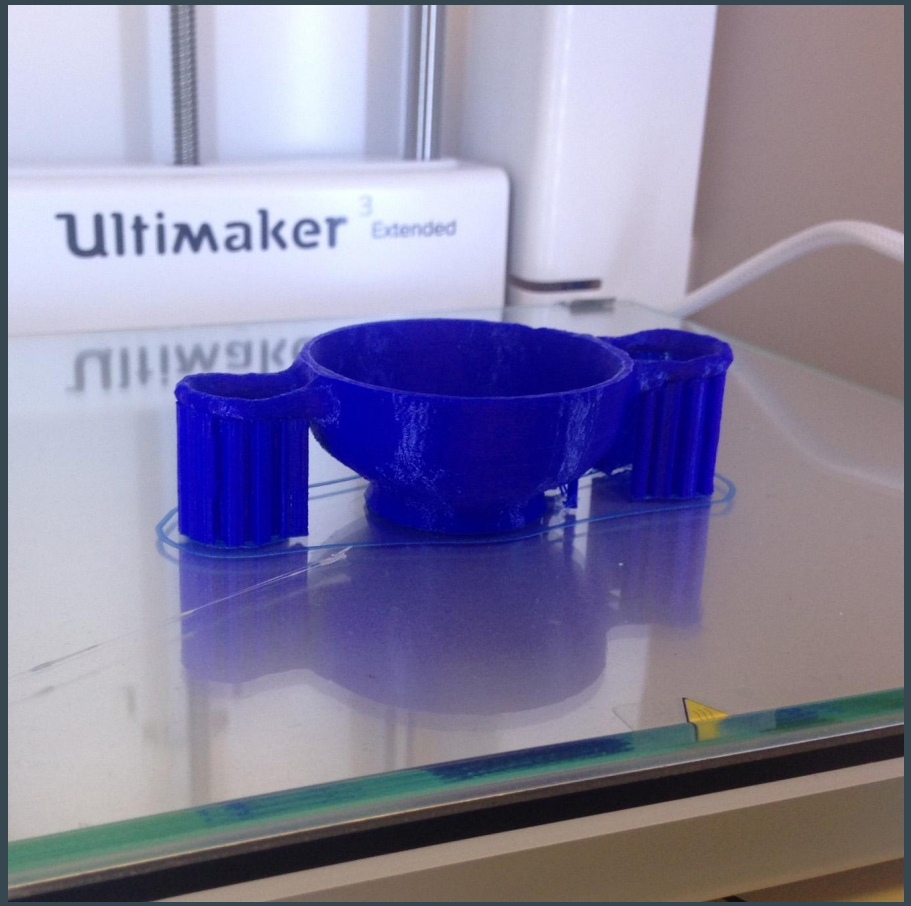


5. Distribution of 3D Models

1. Publishing online
2. 3D Printing



3D printing



Case study 1 - Dean Hall Temple

Project introduction

Archaeological temple reconstruction for an accessible landscape walking simulator.

What we'll discuss:

- Reconstructing from Archaeological data
- Impact of use-cases
- Filling in data gaps

Ellis-Haken, R. and Armit, I. (2024). Cults of the Head? Exploring the Dean Hall temple carvings. *PAST the Newsletter of the Prehistoric Society,* 107, pp. 4-5. [Online].

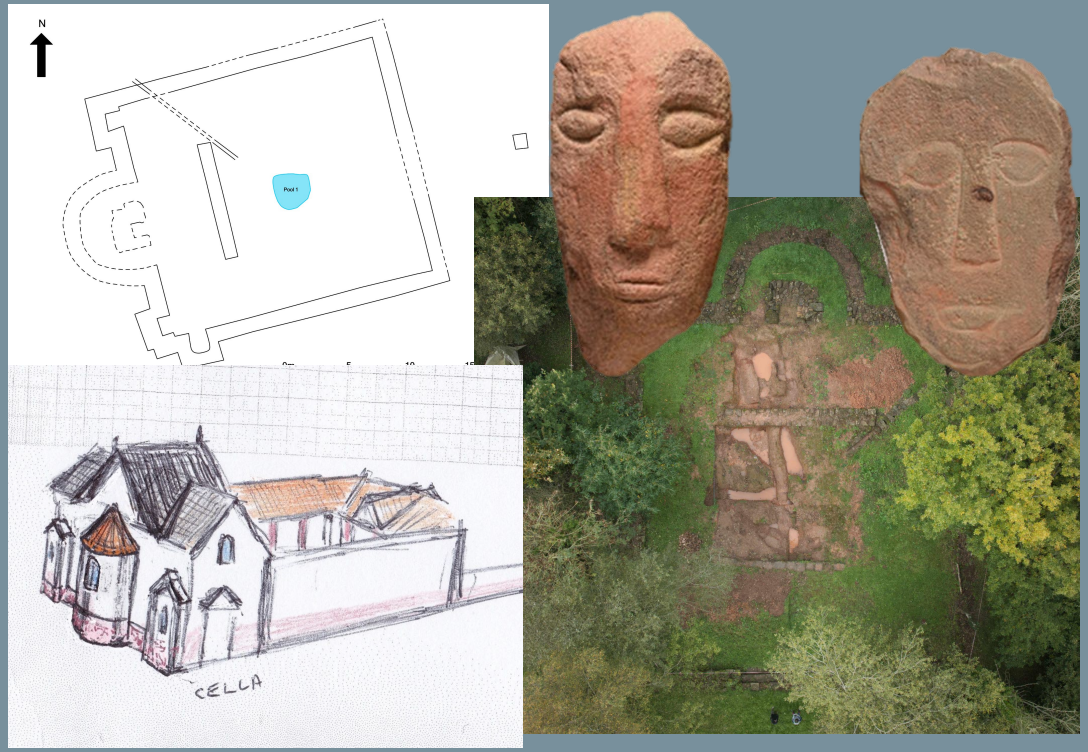
About the Archaeology

Dean Hall Temple

- Roman-British Temple
- Iron-Age to Roman Age
- Centred around a natural spring
- Cults of the Head Project

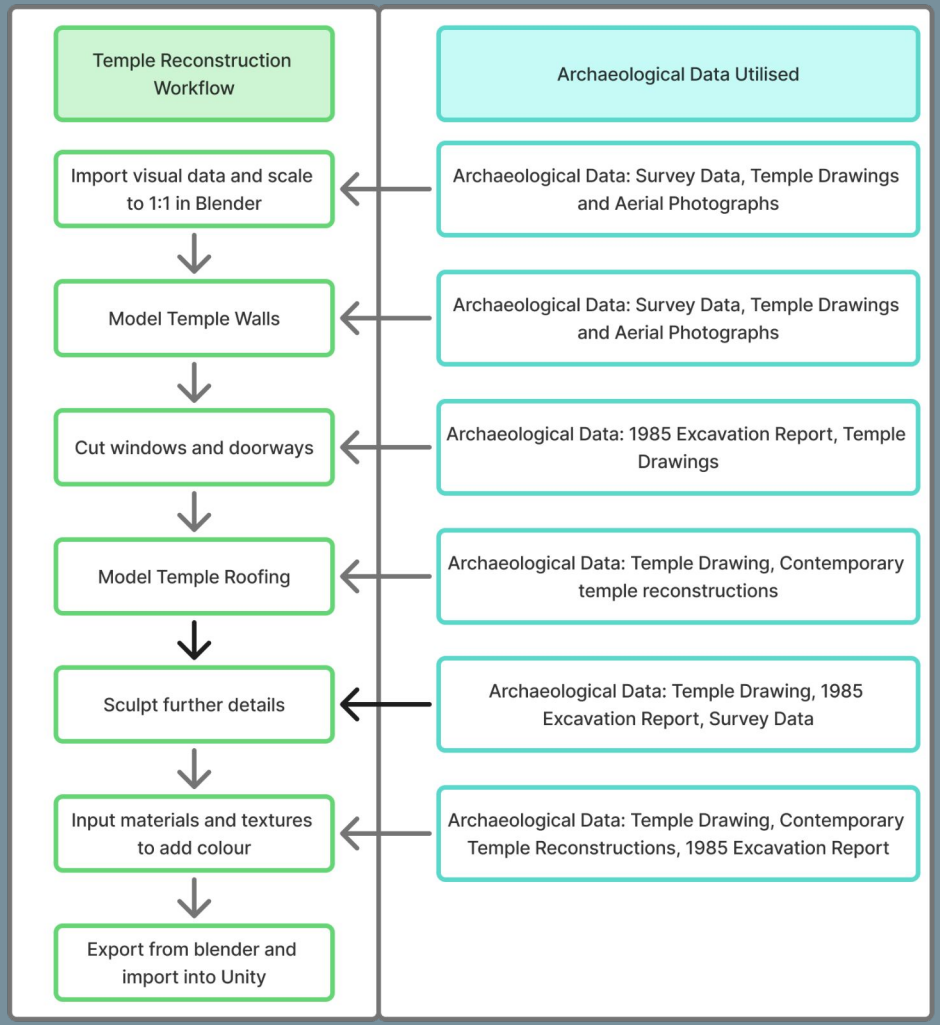
Archaeological Sources

- Remaining walls/foundations
- Modern and legacy excavation data
- Rich material culture



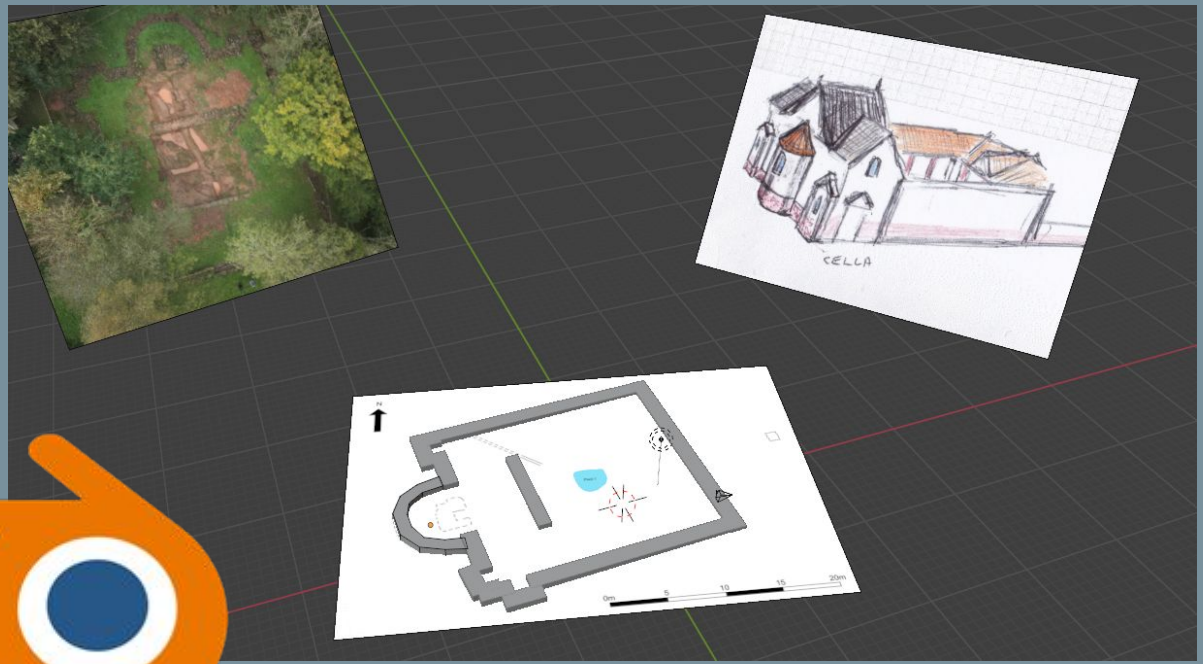
(Beeson 2019; Reb Ellis-Haken, CC-BY; Ellis-Haken and Armit 2024).

Basic Modelling Workflow



Modelling Setup

- Using Survey Data to ensure spatial accuracy
- Reference images around the model



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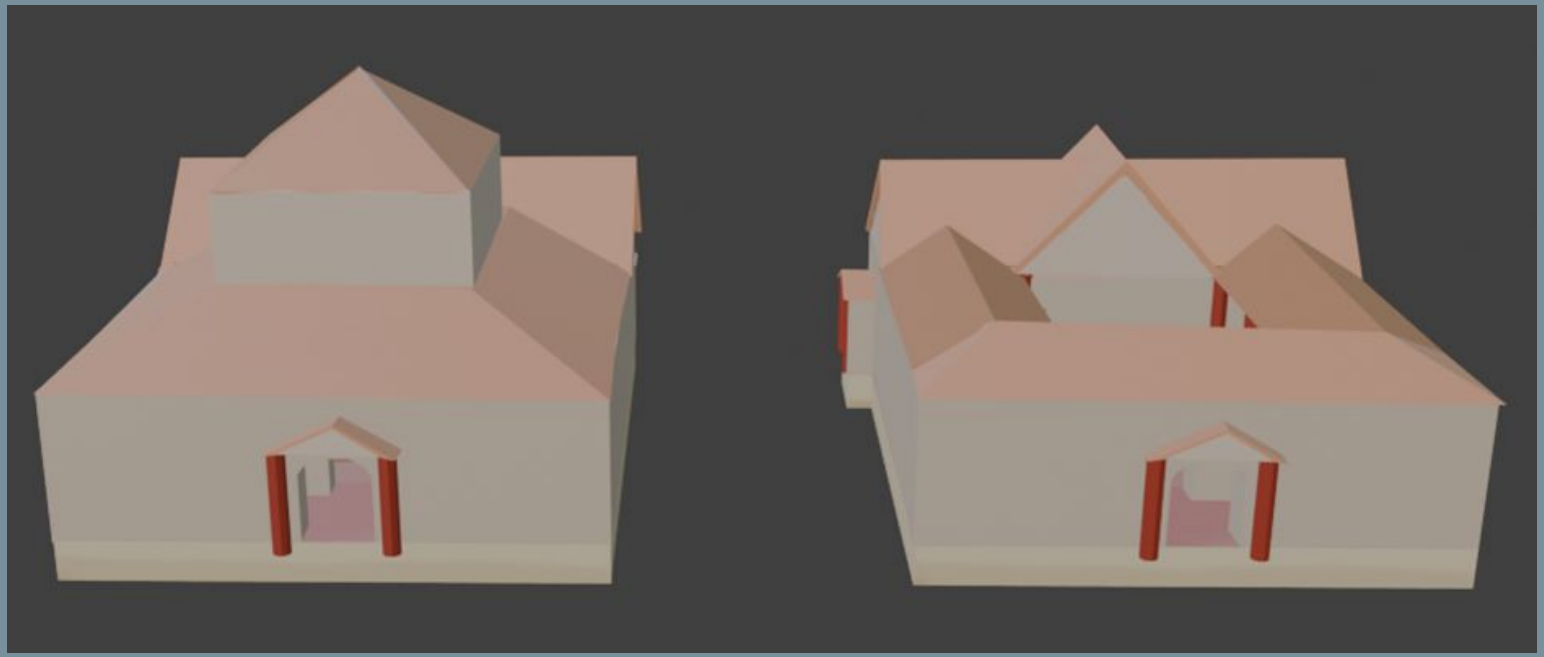
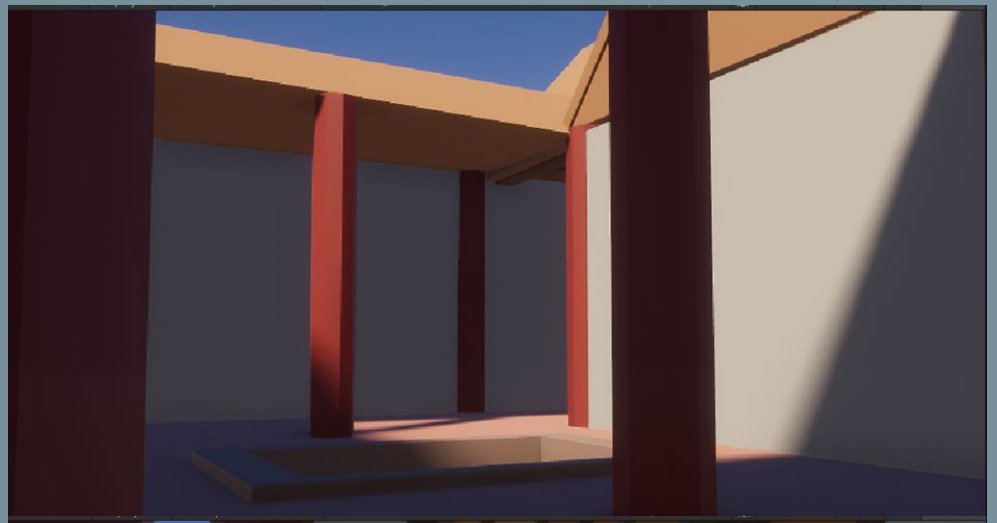
From Known to Unknown



- Try things out
- Utilise other similar sites to fill in gaps
- Creative decisions based on use-intentions

Life and Lighting

- Value of Directional light
- Experiment with positioning
- Can be done in Blender or in a Game Engine



Theoretical introduction

Preservation and Conservation of Cultural Heritage

3D technologies enable non-invasive recording of fragile or endangered sites. Digitally archiving structures protects them from natural degradation, war, and tourism and so on.

Education, Gamification, and Public Engagement - Communication with Both Expert and Public Audiences

3D reconstructions (even in platforms like Roblox or Minecraft) are used to teach archaeology in schools and museums, engaging the public and younger audiences.

Reconstruction of Monuments/Archaeological sites due to loss or other interpretations

3D models allow reconstruction of lost or damaged structures.

Hypothesis Testing Through Simulation and Reconstruction

Allows archaeological hypothesis testing by enabling the modeling of ancient built environments, object functions, and site visibility. Scholars can test theories about how spaces were used, how people moved, and how environments changed over time (i.e. roofs, windows, or even forensic archaeology for human remains positions etc).

Site Mapping - digital archives of whole excavation sites

Drones and Structure-from-Motion (SfM) photogrammetry allow creation of high-resolution 3D models of entire sites - useful for national datasets of city building and development ares (i.e. Athens).

Structural Analysis and Material Assessment

Allows detailed structural and material assessments for conservation planning or restoration processes.

Low-Cost Digital Documentation

Smartphone-based 3D scanning, low-poly approaches, DIY digital approaches, etc. make digital documentation

accessible in low-resource projects (i.e. engage the local communities, conduct unfunded study etc).

Predictive Modelling and Landscape Archaeology

GIS and 3D data help archaeologists model ancient landscapes and predict site locations based on topography, hydrology, and historical usage.

Inaccessible or difficult to access/remote locations

3D modelling improves visualisations in submerged archaeology, such as shipwrecks.

Feminism, Cyborg Theory & Posthumanist Archaeology

Feminist and posthumanist theories interrogate how bodies, technologies, and knowledge intersect. In 3D visualisation, these perspectives highlight **who is represented**, **how embodiment is encoded**, and how **visual authority reinforces or resists dominant ideologies**. Posthumanist feminist archaeology challenges human-centered narratives, introducing **more-than-human** and **entangled perspectives**.

Scholars & Theories:

- **Donna Haraway** (1985): In *A Cyborg Manifesto*, Haraway introduced the "cyborg" as a figure that blurs boundaries between human/machine, nature/culture. This is highly relevant in digital archaeology where **cyborgian relations** between archaeologist, software, data, and interface are core to knowledge-making.
- **Colleen Morgan** (2019): Human, transhuman, posthuman digital archaeologies: an introduction (written with **Marta Díaz-Guardamino**); Avatars, monsters, and machines: A cyborg archaeology. In *Human, Transhuman, Posthuman Digital Archaeologies* (2019), Morgan and Díaz-Guardamino explore how digital technologies reshape archaeological knowledge by decentering the human subject, introducing posthuman and transhuman agencies into archaeological interpretation.

  In *Avatars, Monsters, and Machines*, Morgan extends this by proposing a cyborg archaeology that critically embraces hybridity, embodiment, and digital entanglements highlighting how virtual reconstructions (like 3D models) are not neutral tools but performative and affective assemblages shaped by gender, power, and interface.

Interpretation, Embodiment (theory), and Meaning-Making in 3D Visualisation

3D visualisations are not neutral representations; they are interpretations shaped by the archaeologist's theoretical framework, cultural lens, and narrative intent. Like texts, digital reconstructions are readable and always partial. Every modelling decision (material textures, lighting, uncertainty, gaps in data) carries interpretative weight.

Phenomenology and Embodied Experience

- **Christopher Tilley (1994):** Phenomenological archaeology foregrounds sensory, embodied, and experiential engagement with landscapes and spaces, offering a framework for understanding how users *experience* 3D environments rather than merely view them.
- **Tim Ingold (2011):** Challenges representational thinking by framing archaeology as making, dwelling, and inhabiting rather than mapping; undermines the idea of visualisation as fixed or objective.

Hermeneutics, Reflexivity, and Theory-Ladenness

- **Ian Hodder (1990s–2010s):** Post-processual archaeology emphasises that interpretation is contextual, theory-laden, and reflexive. In 3D modelling, this means reconstructions emerge through iterative interpretative decisions, and the modelling process itself reshapes research questions. In *Entangled* (2012), Hodder's human–thing entanglement provides a powerful lens for understanding how archaeologists and digital tools mutually shape outcomes.

Cyber-Archaeology and Interpretative Simulation

- **Maurizio Forte (2010s–):** Develops cyber-archaeology, arguing that immersive 3D environments function as simulations rather than definitive reconstructions. Interpretation emerges through technological mediation, embodiment, and feedback-based interaction, positioning modelling as a situated practice of knowledge-making rather than a transparent window onto the past.

Embodiment (practice) and Experience in 3D Visualisation

3D environments allow users to *move through, orient themselves within, and act inside* archaeological spaces. Meaning is produced not only through visual observation, but through bodily engagement, spatial movement, and performative interaction. This supports experiential learning and alternative ways of imagining the lived past.

Key Scholars & Contributions:

- **Michael Shanks & Christopher Tilley:** Emphasise that archaeology concerns how past spaces were *experienced and inhabited*, not merely interpreted from data; this perspective underpins experiential approaches to 3D environments.

- **Colleen Morgan:** Demonstrates how digital modelling and immersive practices are *embodied and performative*, particularly in fieldwork and participatory digital archaeology, where knowledge emerges through doing rather than passive viewing.

Shanks, M., & Tilley, C. (1992). Re-Constructing Archaeology: Theory and Practice. Routledge.

Morgan, C., & Eve, S. (2012). DIY and digital archaeology: what are you doing to participate? World Archaeology, 44(4), 521–537.

Ethics, Authority, and the “Aura of Truth” in Archaeological 3D Visualisation

Critical and reflexive approaches to 3D visualisation argue that digital reconstructions are not neutral or purely technical outputs. In archaeology, 3D visualisations function as **interpretative arguments** that reflect institutional priorities, narrative choices, and underlying power relations. Decisions about realism, completeness, and presentation shape how the past is understood and can produce an *“aura of truth”* that masks uncertainty and presents interpretation as fact.

Key Theorists & Contributions

- **Walter Benjamin (1935):**
  Although not writing about archaeology or 3D models, Benjamin’s concept of *aura* provides a critical lens for understanding how reproduced images gain authority. Applied to 3D visualisation, this framework helps explain how highly realistic reconstructions can project authenticity and credibility beyond their evidential basis.

- **Stuart Jeffrey:**
  Extends Benjamin’s ideas to digital heritage, arguing that archaeological 3D models can acquire aura through visual fidelity and aesthetic polish. Jeffrey highlights the risk that realism is mistaken for accuracy and advocates transparency, paradata, and co-creation to counter misleading authority.

- **Jeremy Huggett:**
  Critiques techno-positivism in digital archaeology, warning that 3D visualisation can appear scientifically objective while embedding unexamined assumptions, biases, and exclusions. His work underlines the need for reflexive and critically documented modelling practices.

Theoretical Frameworks Supporting 3D Visualisation

- **Archaeology of Personhood**
  → Frames 3D reconstructions as ethical, human-centred narratives that respect the individuality of past people.

- **Osteobiography**
  → Justifies reconstructing life histories and bodies in 3D to convey the complexity of lived experience.

- **Postcolonial and Decolonial Theory**
  → Critically examines whose stories are visualised and challenges colonial legacies in digital reconstructions.

- **Cryptocolonialism**
  → Decolonisation of heritage discussions.

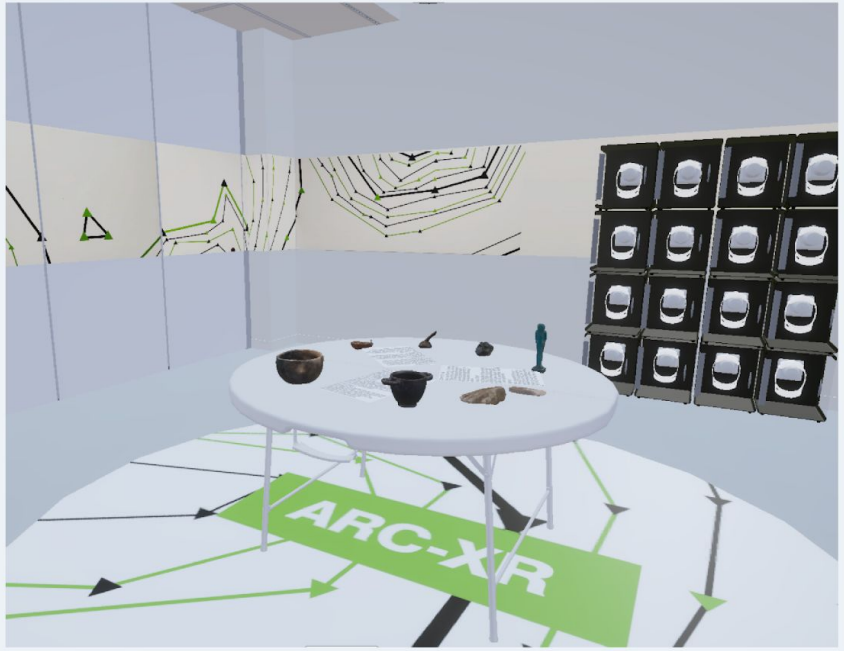
- **Digital Public Archaeology**
  → Supports using 3D tools to democratise archaeological knowledge and engage broader, non-expert audiences.

- **Narrative Theory / Archaeological Storytelling**
  → Treats 3D models as interpretive stories rather than objective records, emphasising the power of narrative design.

- **Immersion and Interaction Theory (VR/IDN)**
  → Explains how 3D spaces enable embodied, affective experiences that deepen understanding of the past.

- **Pragmatism (philosophical grounding)**
  → Justifies flexible, context-driven use of 3D methods based on what works best to meet interpretive and communicative goals.

EXPERIMENTAL DESIGN
ARC XR-LAB + DIGITAL TWIN



EXPERIMENT GROUPS

Group	Participants	First World	Second World	Set of Objects (first round)	Set of Objects (second round)
A	6	Virtual	Physical	1 - 9	10 - 18
B	6	Physical	Virtual	1 - 9	10 - 18
C	6	Physical	Virtual	10 - 18	1 - 9
D	6	Virtual	Physical	10 - 18	1 - 9

CULTURAL OBJECTS









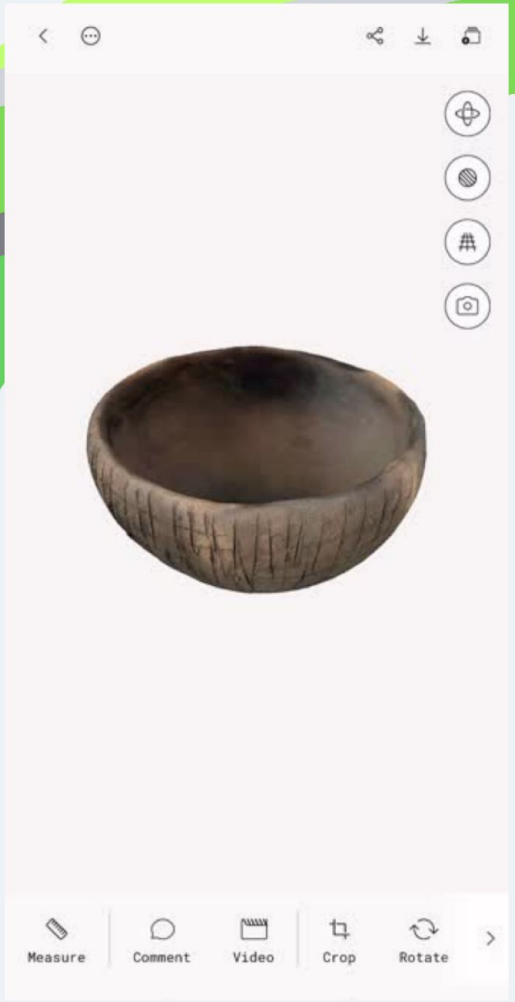


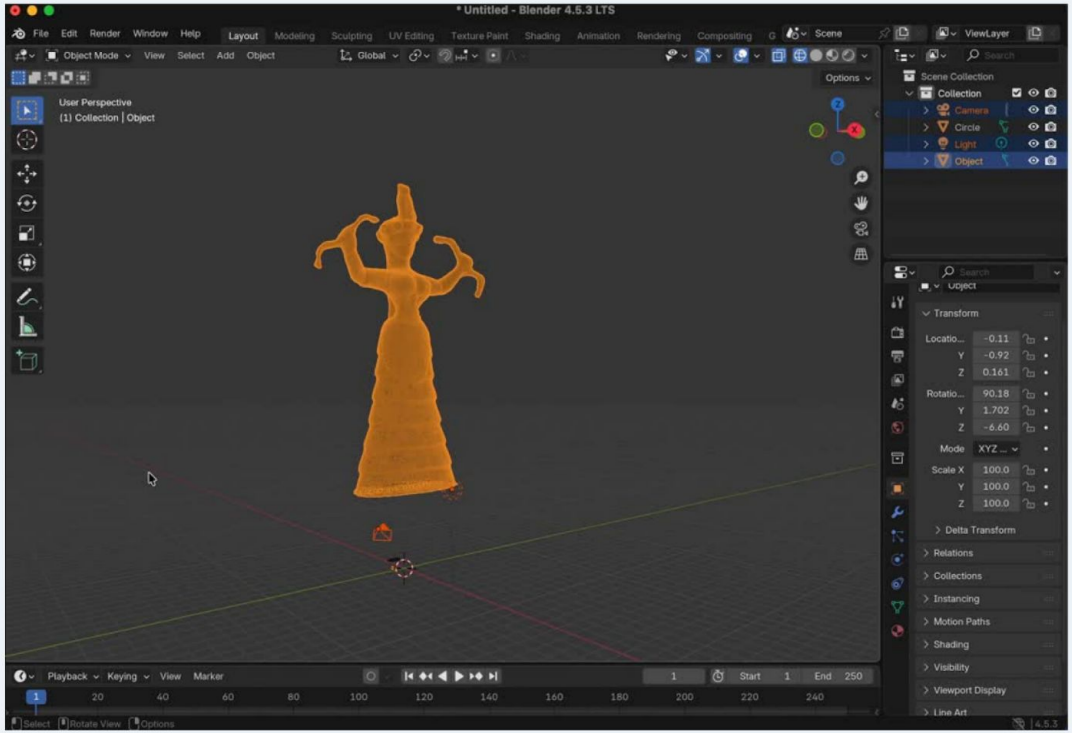




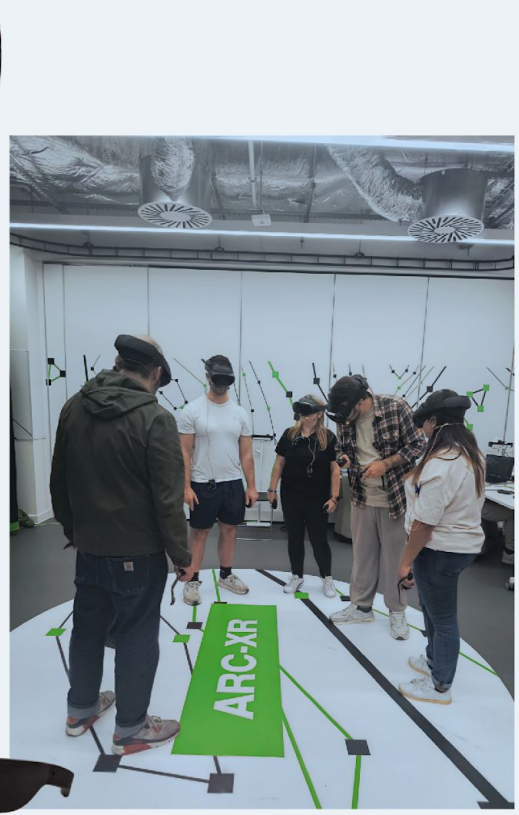



3D SCANNED AND RECONSTRUCTED OBJECTS





REALITY VS VIRTUALITY



Case study 2 - Messing with Meshes

Project introduction

Experimental research into Re-use of archaeological photogrammetry.

What we'll discuss

- Importance of creative modelling
- How to manipulate a pre-existing mesh
- Common Pitfalls
- How to re-use assets within your practice

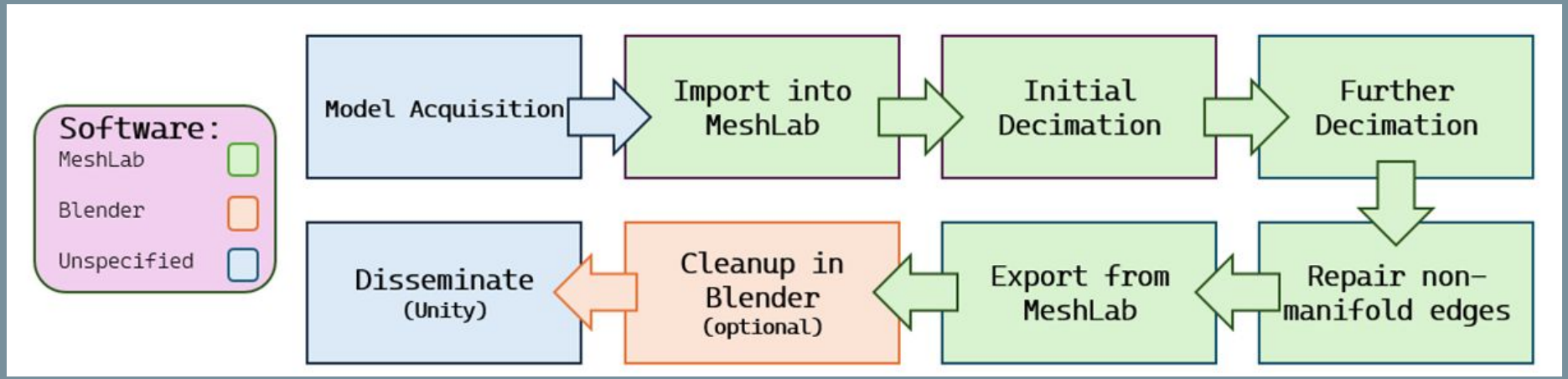
You don’t need to model everything from scratch.

Workflow

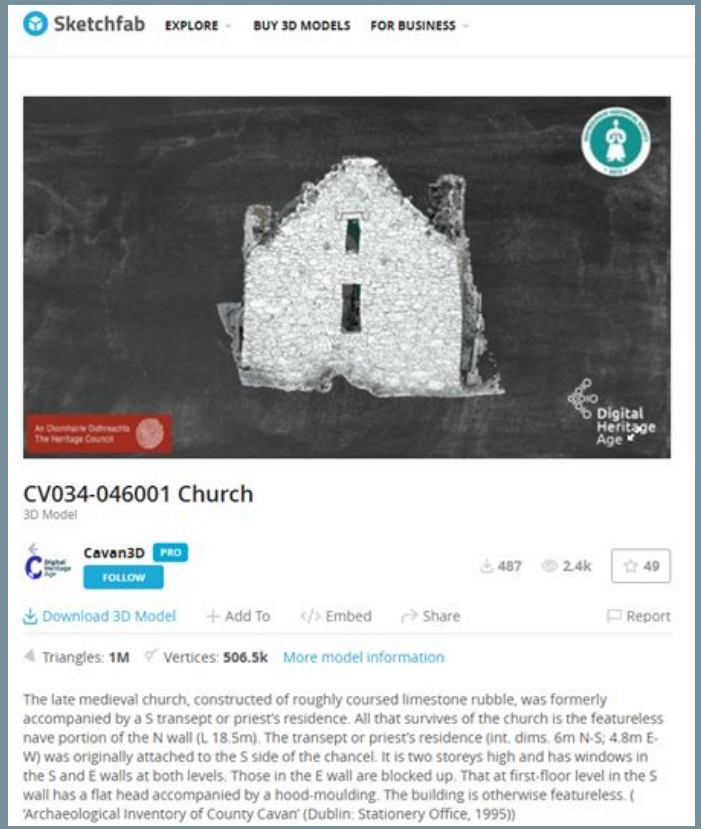
Meshlabs

Blender

Unity

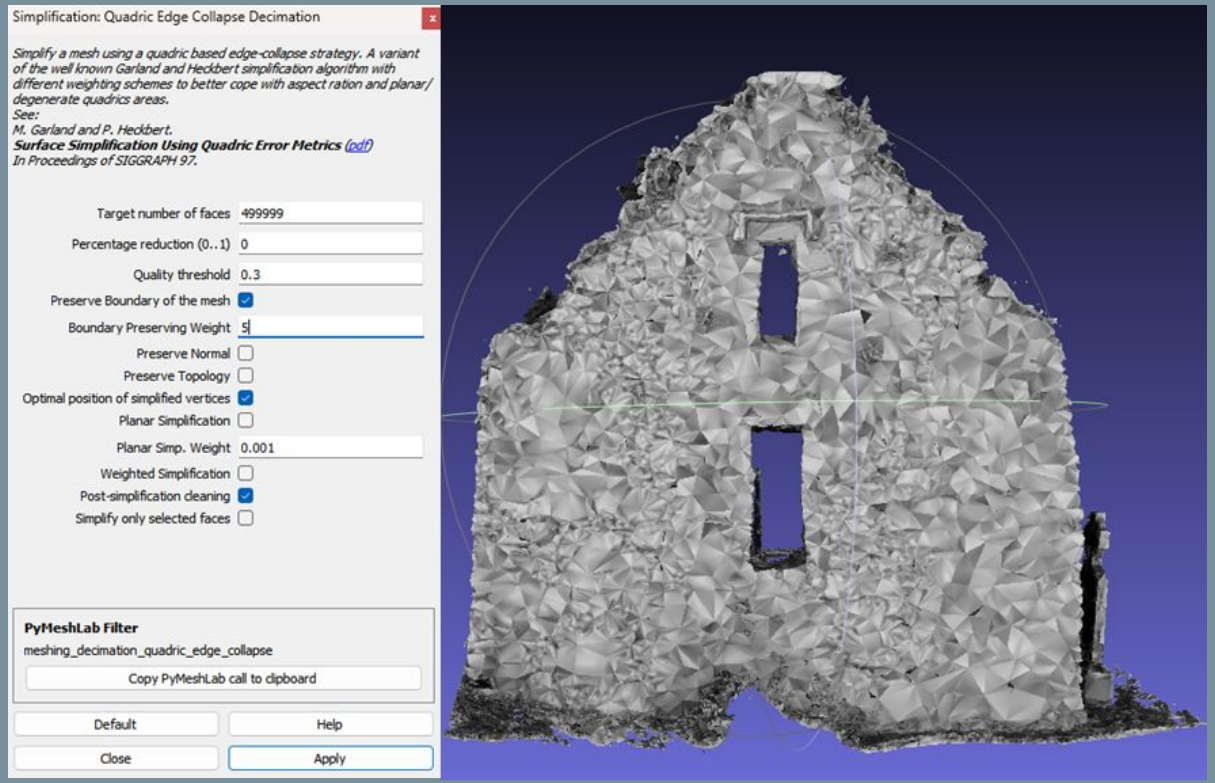


Model Acquisition



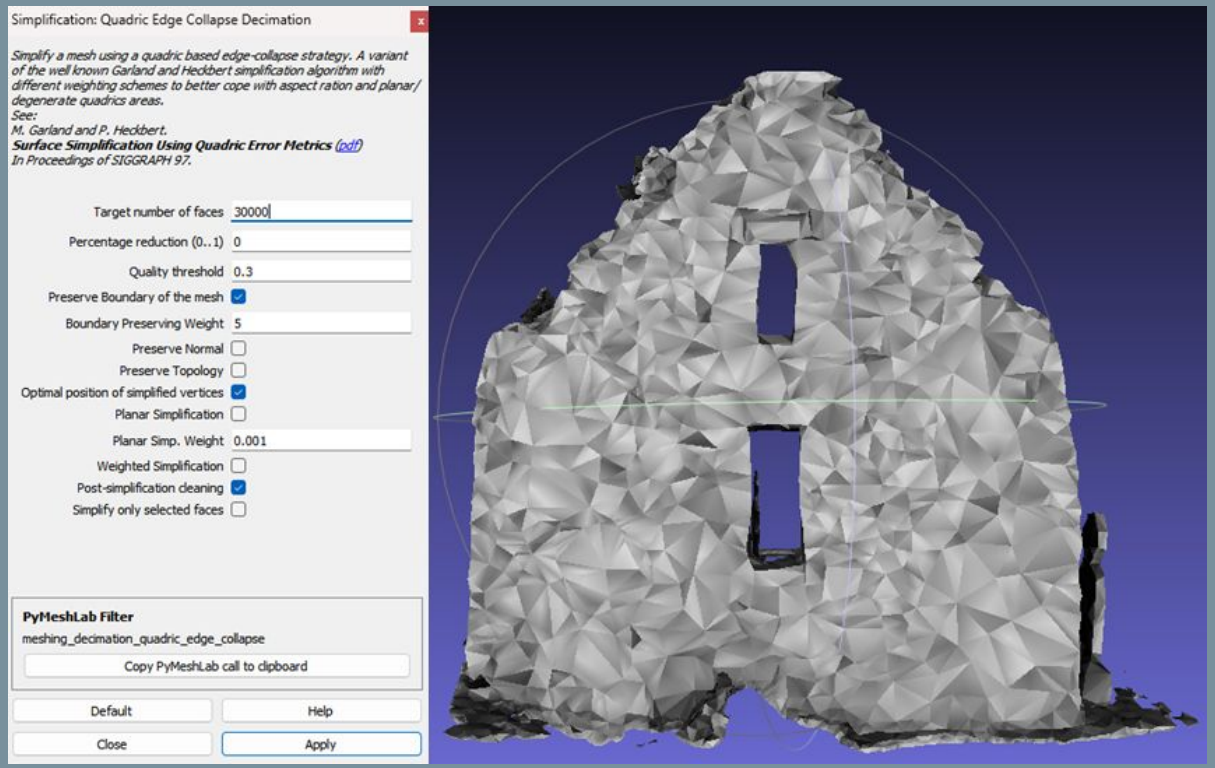
- Works well on large models
- Can be from range of sources
- GLB format
- Example from Sketchfab

Initial Decimation



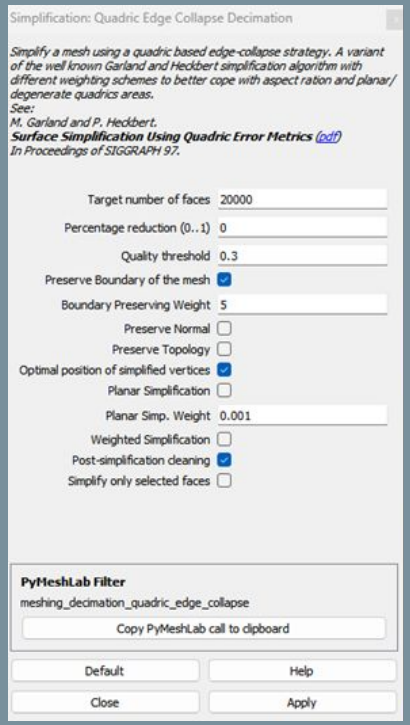
- Using Simplification: Quadric Edge Collapse Decimation
- Not yet Low-Poly
- Irregular decimation
- Prepares model for further decimation

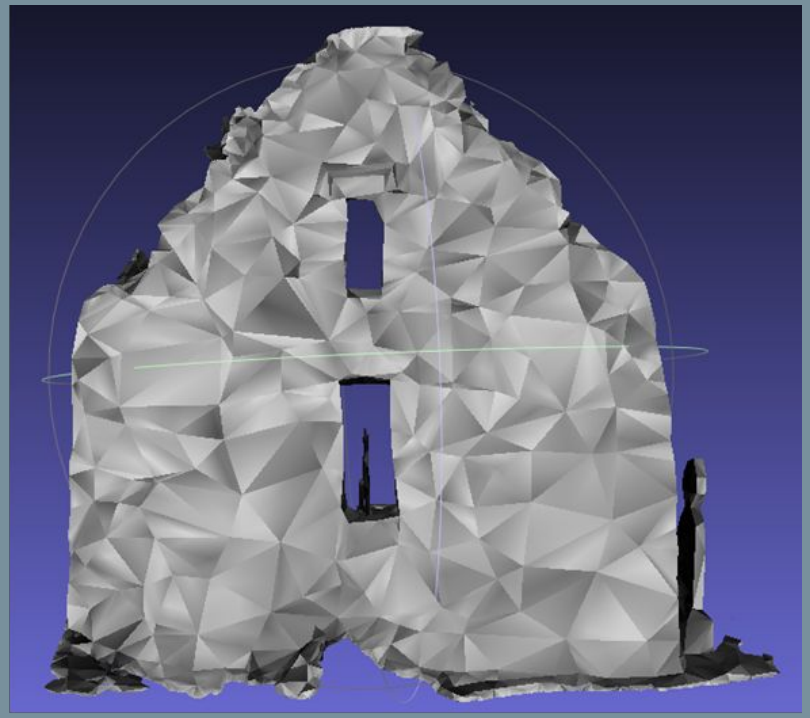
Further Decimation



- Reduce faces count until desired visual effect.
- Boundary preserving weight set to 5
- Done gradually to avoid model collapsing.

Further Decimation





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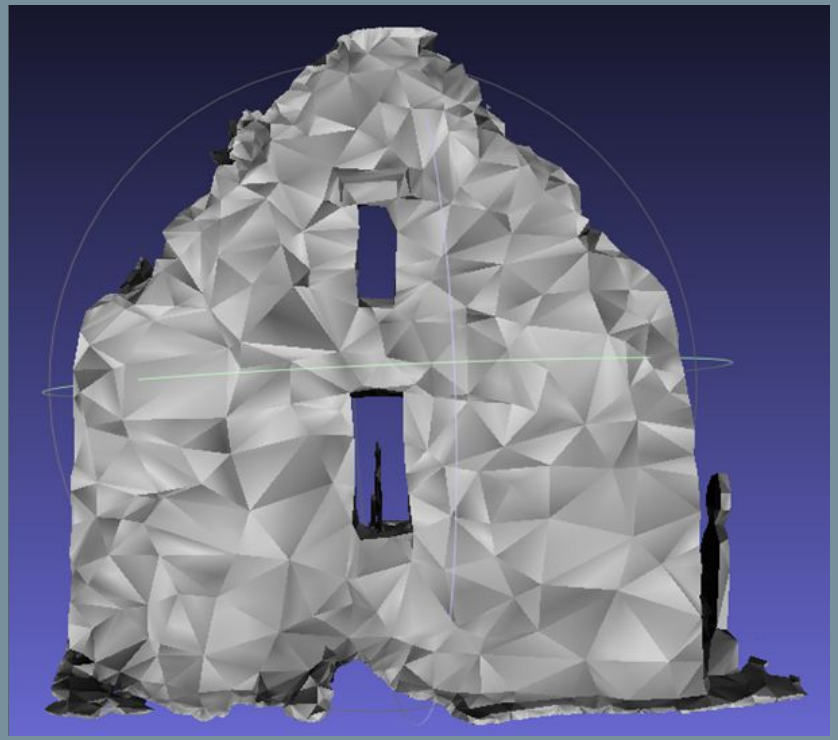
Repair Non-Manifold Edges



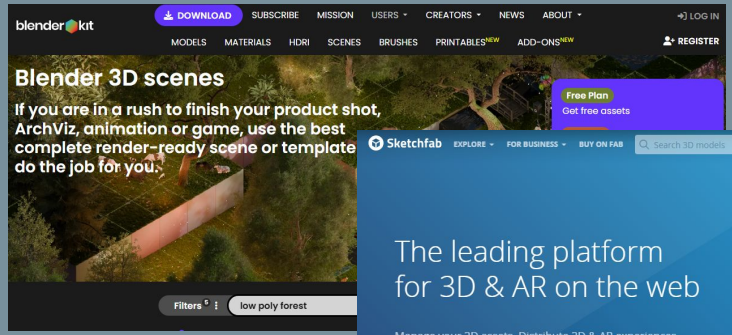
- Limited visual impact
- Improves integrity of model

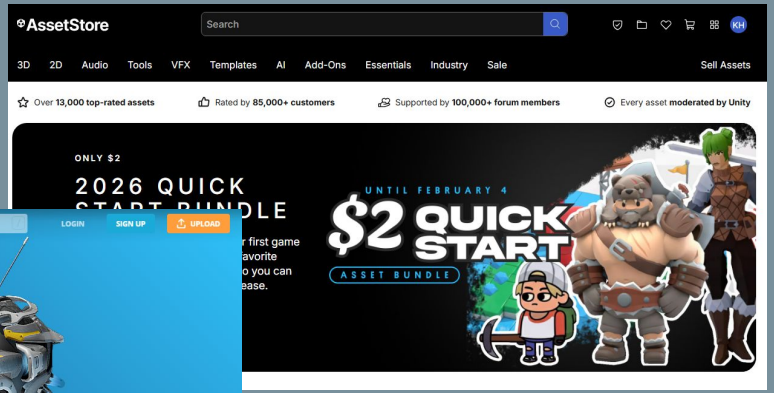
Post-MeshLab

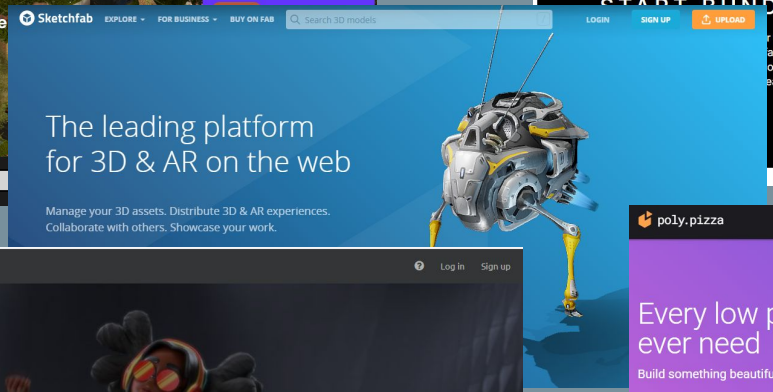
- Export model
- Cleanup based on usage
- Model ready to use in low-poly environments

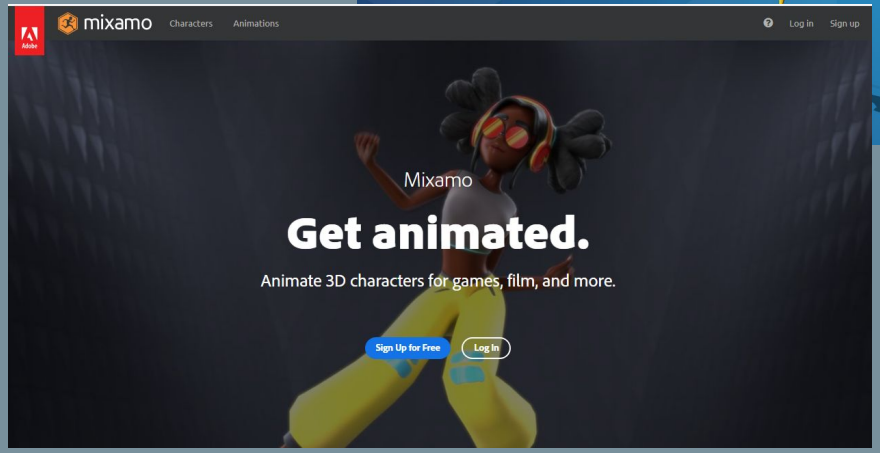
Model Manipulation Pitfalls

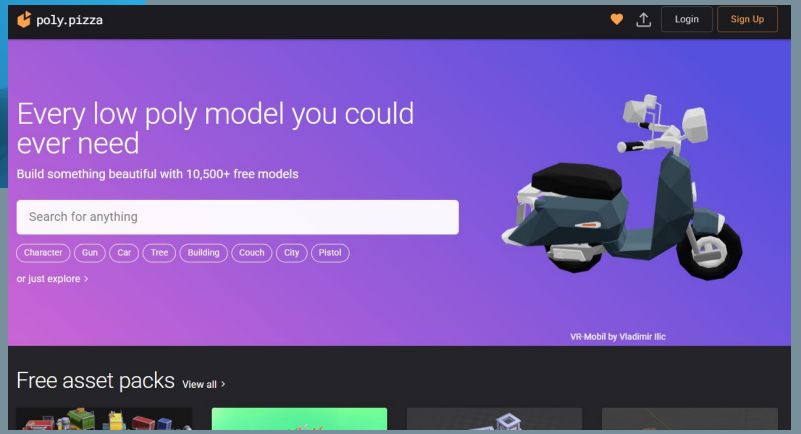
Reusable assets





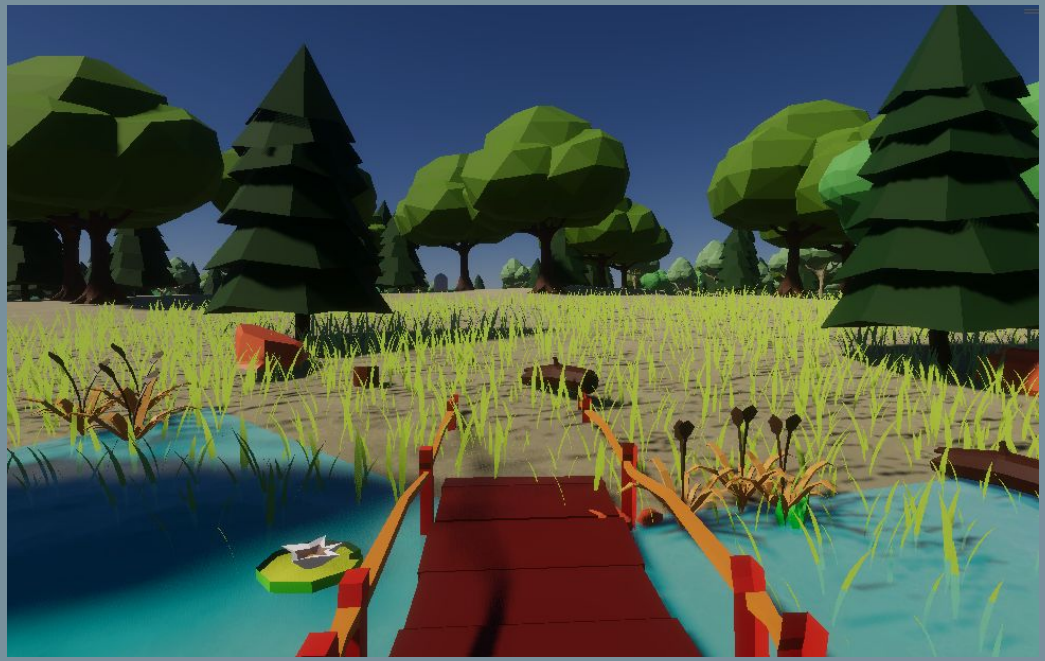






Use Cases

- Background visuals
- Small details
- Bringing a scene ‘to life’



Things to look for

- Open source/Open Access
- CC0 licence
- Free to modify
- Always give credit where possible

Case study 3: Ekklesiasterion of the Temple of Isis in Pompeii

Vues des Temples Grecs de Pompeia près de naples