

ARCHAIDE

ARCHAEOLOGICAL
AUTOMATIC INTERPRETATION
AND DOCUMENTATION
OF CERAMICS

Holly Wright + Tim Evans

Archaeology Data Service
University of York



This project has received funding from the
European Union's Horizon 2020 research
and innovation programme under grant
agreement No 693548



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AUTOMATIC INTERPRETATION
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Funded by EU H2020

Research and Innovation Action

Duration: **36 months**

June 2016 to May 2019

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European Union's Horizon 2020 research
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Pottery often represents a significant percentage of finds in many parts of the world, and therefore significant investment of time and expertise.



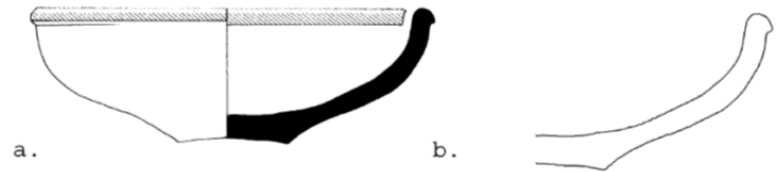
Analysis of sherds:

(a) the identification of the ceramic class, the specialist looks at:

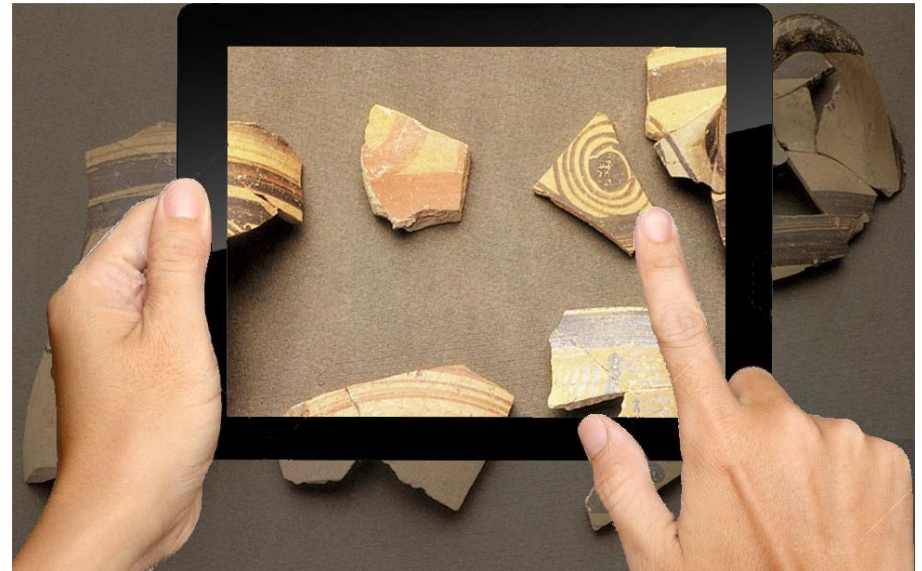
- surface treatment,
- the decoration
- the fabric

(b) identification of the **form type**:

- looks into the ceramic class paper catalogues for the specific form;
- analyses **the section of the potsherd and its profile**;
- makes a comparison with published types (**hundreds of pages and drawings**)



ArchAIDE is developing a new app for tablets and smartphones to speed and support the ceramic classification and interpretation work of archaeologists, during both fieldwork and post-excavation analysis.





University of York
Archaeology Data Service

University of Cologne
Institut für Archäologie

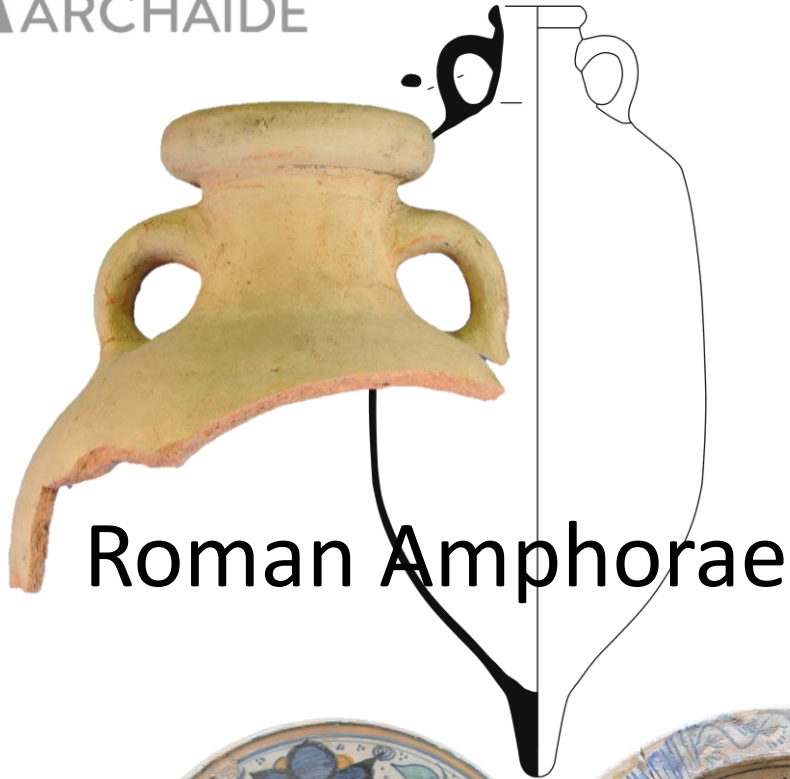
University of Barcelona
*Fac. de Prehistòria, Història Antiga
i Arqueologia*

BARAKA
ELEMENTS

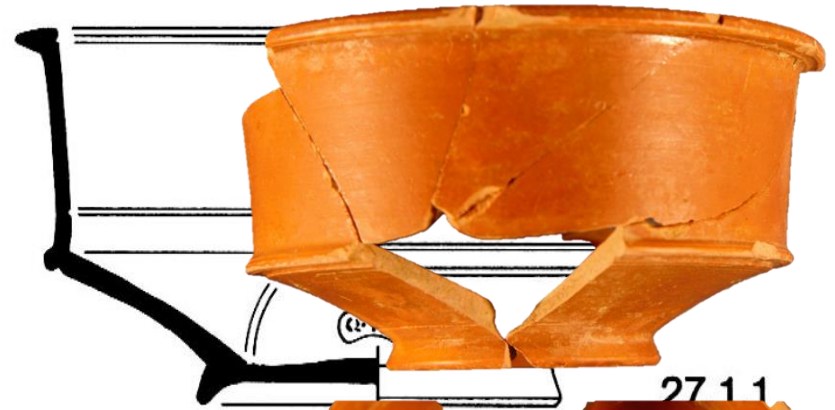
University of Pisa (coordinator)
Dipartimento di Civiltà e forme del sapere
CNR –Istituto di Scienza e Tecnologie dell’Informazione
INERA srl

University of Tel Aviv
School of Computer Science





Roman Amphorae

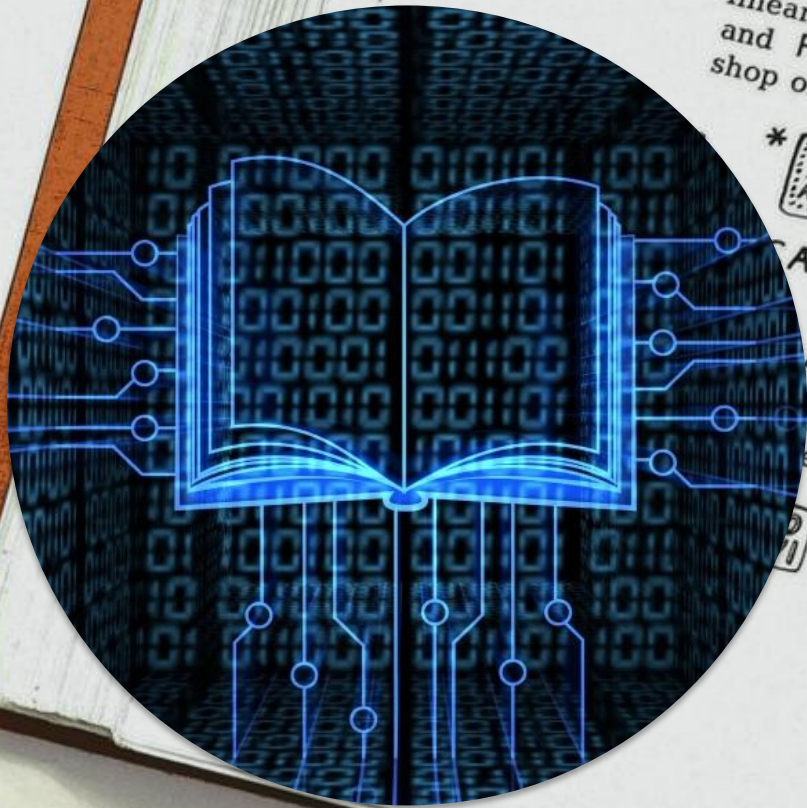


Terra Sigillata



Majolica

[catalogues]



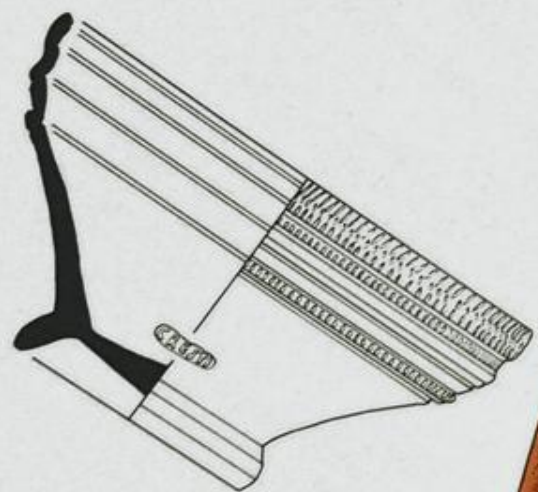
Alexandria (Mu 2
'Form 18?' Perha
stamp of a Gaulish
10010 455, VII 13
5686 183. On the o
linear stamps such a
and PRI· VIII were
shop of Naevius.



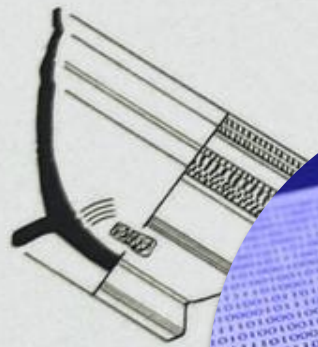
CARBON

NAEVI

Berlin Altes Mu
exx.




25.1.1



[Digitisation]

Digital Resources


ARCHAEOLOGY DATA SERVICE


[HOME](#) [SEARCH](#) [DEPOSIT](#) [RESEARCH](#) [ADVICE](#) [ABOUT](#) [HELP](#)

Roman Amphorae: a digital resource

University of Southampton, 2005 (updated 2014)

Home
Introduction
Catalogue
Fabrics
Search
Reference
Metadata
Usage Statistics

Data copyright © University of Southampton unless otherwise stated
This work is licensed under the ADS Terms of Use and Access.




Africana 1 Piccolo


[next amphora type](#)

[details](#) | [characteristics](#) | [pictures](#) | [drawings](#) | [petrology](#) | [specimens](#) | [bibliography](#)


Click on the image to see metadata record and link to larger version of the image for download.




*Courtesy of Dr. D. F. Williams
David Williams*



*Courtesy of Prof. David Soren
David Williams*



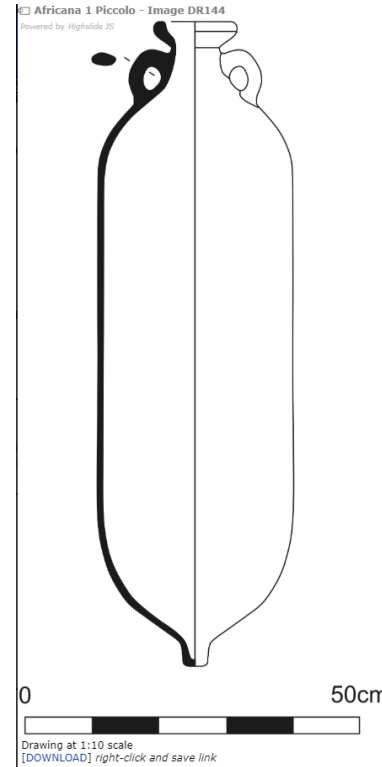
*Courtesy of Museu Nacional
Arqueologia de Tarregaona (Dottora
Pilar Sotgi)*



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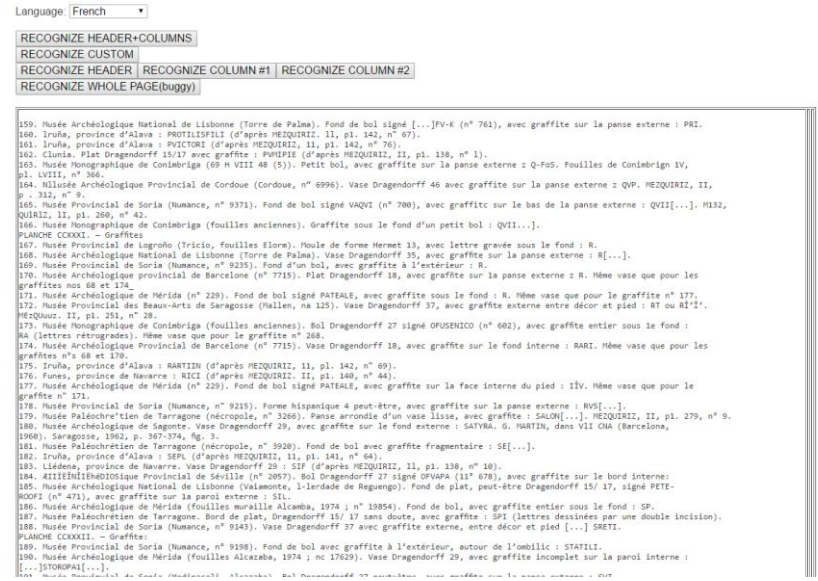
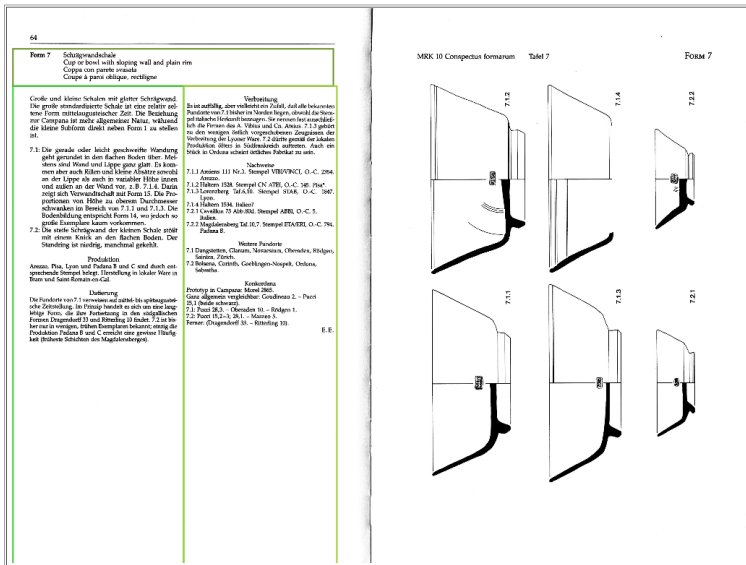
[Send e-mail enquiry](#)

Resource identifiers
ADS Collection: 463
DOI: <https://doi.org/10.5284/1028192>
How to cite using this DOI



<https://doi.org/10.5284/1028192>

(Assisted) manual and automatic text digitisation



What we have:

Production

Subform 23.1 is probably made in many parts of Italy; examples in Padana ware do not show applied decoration. Subform 23.2 is made in Italy but apparently not in the Padana region.

Distribution

Subform 23.2 is very common throughout the Mediterranean region, with sporadic examples found in the North and in North-Italy; Subform 23.1 is relatively uncommon.

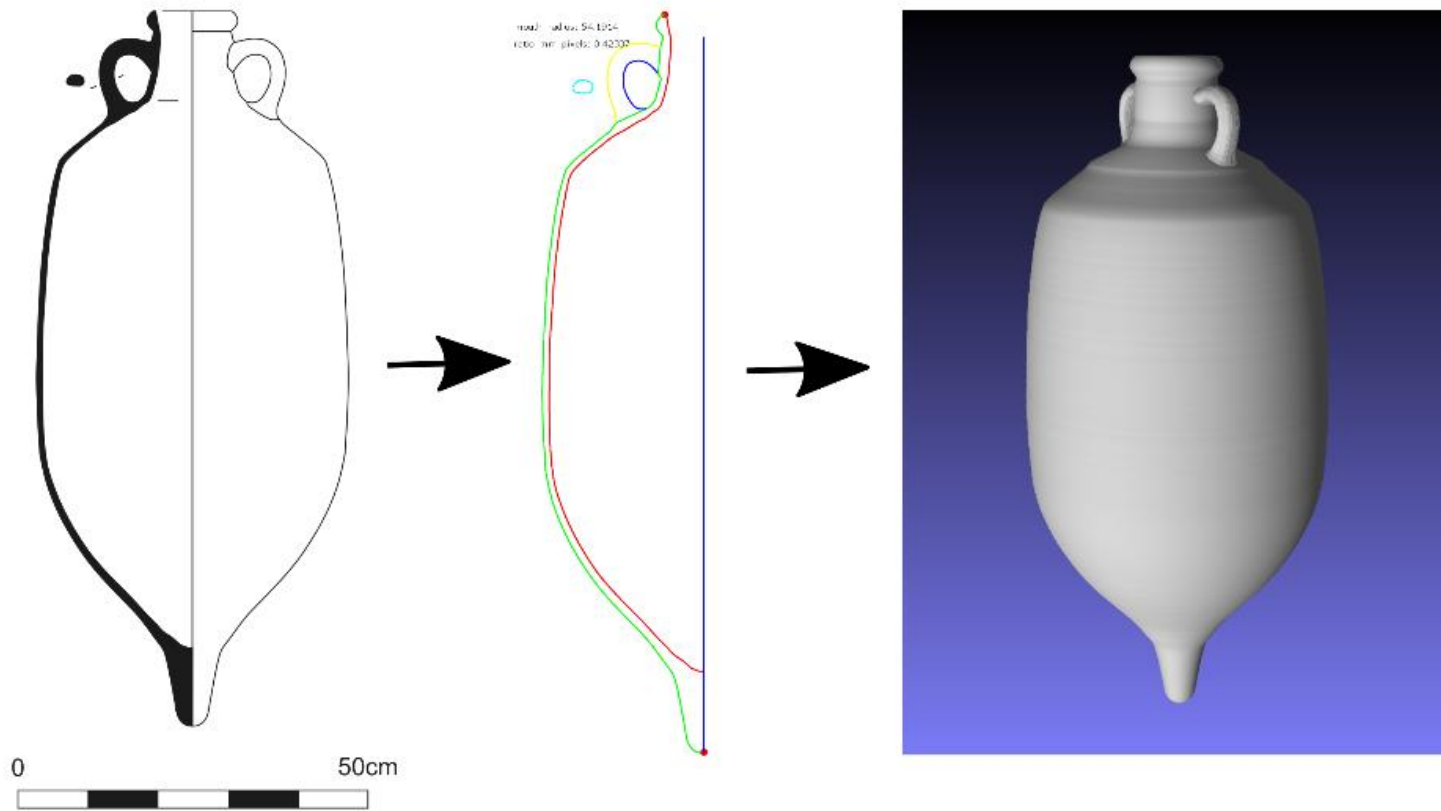
UNSTRUCTURED DATA

What we want:

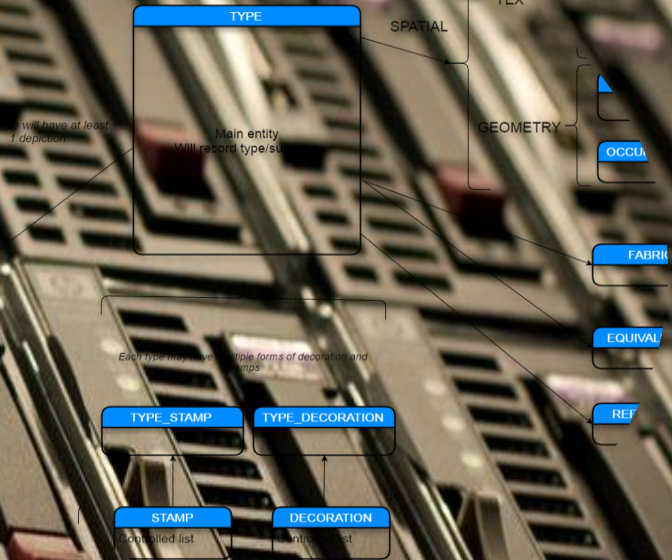
```
{
  "form": "23.1",
  "origin": "Italy",
  "decoration": "none",
  "occurs": "uncommon"
},
{
  "form": "23.2",
  "origin": "Italy, not Padana",
  "occurs": "Mediterranean region;
              North-Italy"
}
```

STRUCTURED DATA

From drawings digitisation to 3D models



[database]



Database design

The database is designed to:

- Hold images, shape models and descriptive data from the comparative collections
- Allow the recognition technologies developed to be applied
- Incorporate data from users

Multilingual vocabularies

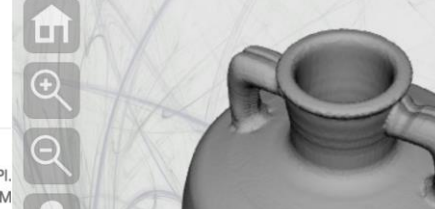
- Allows mapping of concepts rather than terms by archaeologists
- Different recording traditions may not only use different words, but work at different levels of granularity.
- Concepts are mapped to the Getty AAT as a 'neutral spine' to allow interoperability with other resources.



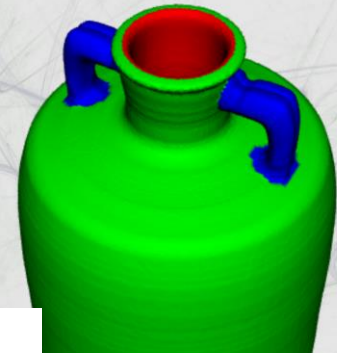
Database implementation

Agora G199 Amphorae

Powered by 3DHOP



Powered by 3DHOP



Distinctive Features

This type of amphora is known as the Agora G199 (Robinson, 1959: 43 Pl. Ostia forma 631 (Panella, 1973: 474-6 Fig. 34); Zemer no. 41 (1978: 52); M Amphora 4 (Riley, 1979: 186-7); *Nea Paphos* amphora (Leonard, 1995: 144-5); Dyczek, 2011). It has distinctive short and right-angled handles, with the vertical handle bar longer than the horizontal one. At first the vertical handle bar is longer than the horizontal one. The body is elongated and tapers to a narrow neck with a mushroom rim gently everted. Early versions have a long neck, sometimes with a 'mushroom' cap at the base. The relationship between the late third and fourth centuries AD (as Robinson, 1959: Pl. 28) needs to be clarified (cf. Slane, 2004: 100).

Origin

Occurs



Courtesy of Dottsa Lucrezia Ungaro, Museo Dei Fori Imperiali e Mercati Traianei
Media Type: Photograph
Scale: Photograph of whole amphora
Original Source:



Courtesy of Dr. D. F. Williams
Media Type: Photograph
Scale: Photograph of partial amphora
Original Source:



Media Type: Photograph
Scale: Hand specimen, fresh broken surface
Original Source:



Courtesy of Bodrum Museum of Underwater Archaeology
Media Type: Photograph
Scale: Photograph of whole amphora
Original Source:

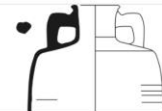
mouth_radius: 53.3446
ratio_mm_pixels: 0.42337



Profiles_SVG_DR167
Media Type: Drawing
Scale:
Original Source:

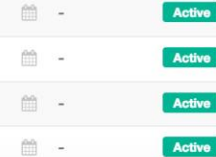


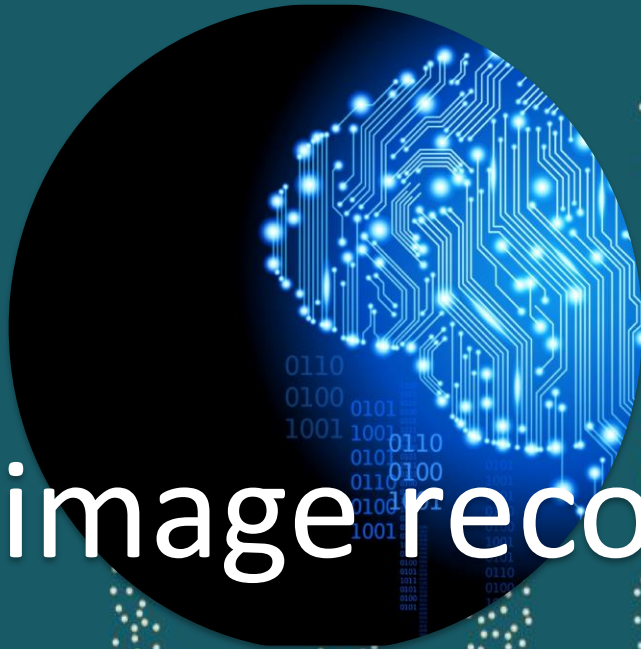
3D_Model_DR167
Media Type: 3D model
Scale:
Original Source:



After Sciallano & Sibella, 1991
Media Type: Drawing
Scale: Drawing at 1:10 scale
Original Source:

199 fabric





[image recognition]

DEEP LEARNING

[appearance and shape based similarity search and retrieval]

Appearance based recognition

Decoration

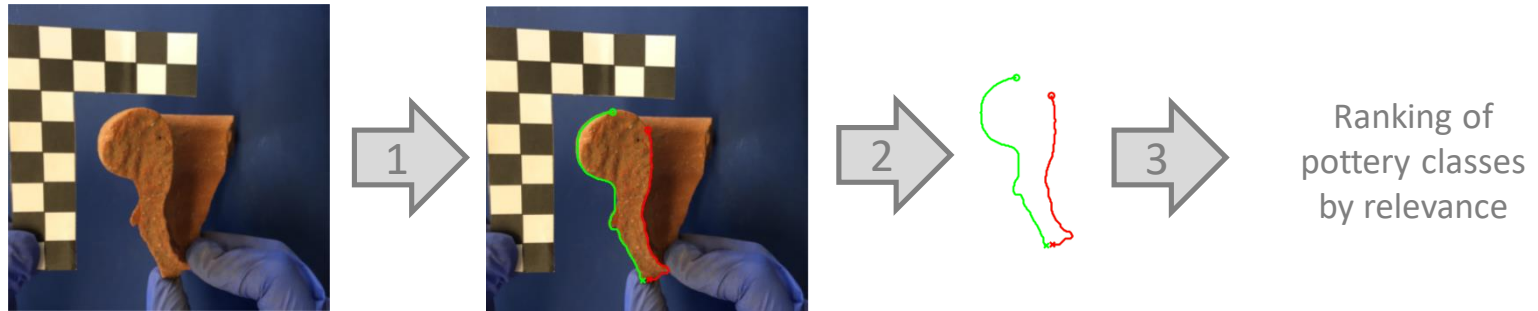


Stamps



Shape based recognition

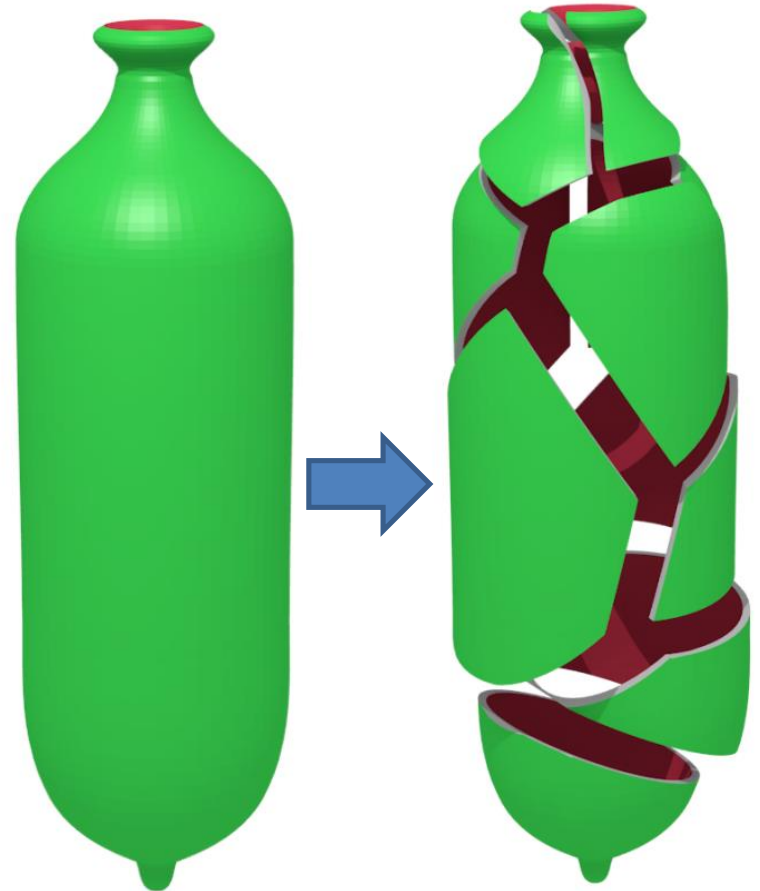
- Following discussion with pottery specialists, a methodology was defined on how the data should be classified



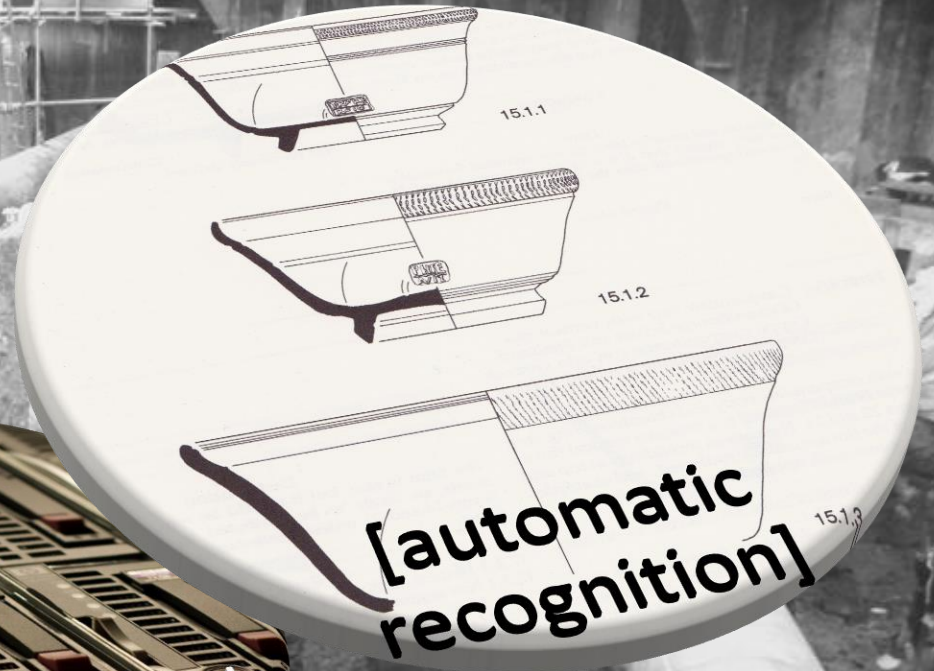
1. The user annotates a profile on a picture
2. The shape is extracted from the annotation
3. This shape is used for finding similar profiles, and ranking them by relevance

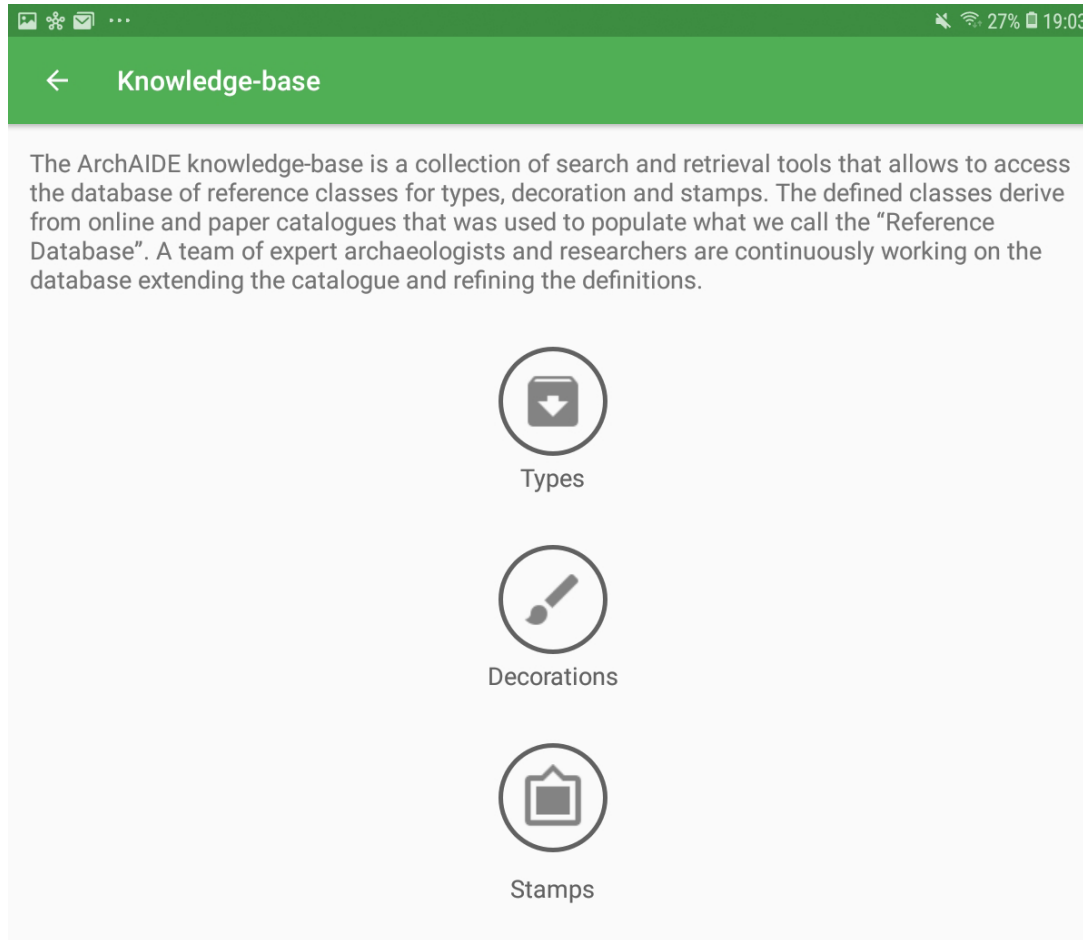
The main steps for building the shape-based system are:

- Extract pottery profiles from the catalogues
- Reconstruct 3D models of the pottery from the profiles
- Generate a database of synthetic sherds for each class
- Extract the fracture shapes from the sherds
- Train the neural-network to learn how to classify the sherds by their fractures



[workflow]







← Sherd: Test assemblage / test1
🏠

Sherd data

Assemblage: Test assemblage **Sherd:** test1


Ceramic Class

Form

Part

Notes

789a7570d8687006bd492ecca4e25f46




Classification

TYPE	DECORATION	STAMP
Genere 26. Fascia con ovali e rombi.		90%
3. Foglia di prezzemolo		6%

🗑️
+

789a7570d8687006bd492ecca4e25f46




- Image recognition
- Shape recognition
- Stamp classification
- Share
- Remove

+



← Results
🏠 📄



- Genere 26. Fascia con ovali e rombi.**

Il genere 26, nella fase ancora sperimentale di costruzione della tipologia "a ovali e rombi". ha un motivo principale costitutivo

90
- Genere 13. Foglia di prezzemolo**

Questa tipologia decorativa, concepita come l'insieme di minuscoli seani incrociati in blue cobalto. di forma simile a quella

5
- Genere 27. Fascia con ovali**

Si tratta di un decoro pertinente alle sole forme chiuse, che si presenta strutturalmente simile al genere precedente. in quanto

2
- Genere 38. Piatti baccellati**

Il genere 38 si colloca tra le produzioni minori del primo periodo rinascimentale. le crespine a basso piede rappresentano un

0
- Genere 18. Fasce Geometriche**

La tipologia che abbiamo definito "fascia a triangoli" ci fornisce uno dei casi più emblematici di trasformazione e costruzione di

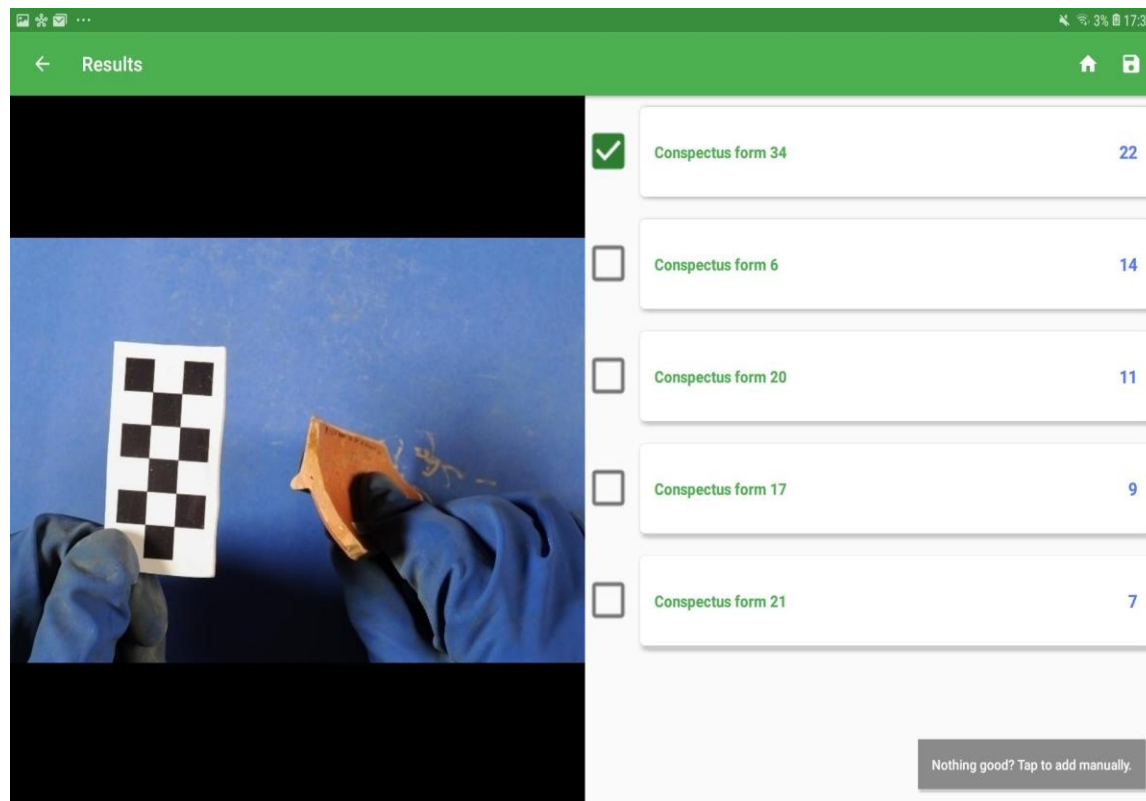
0

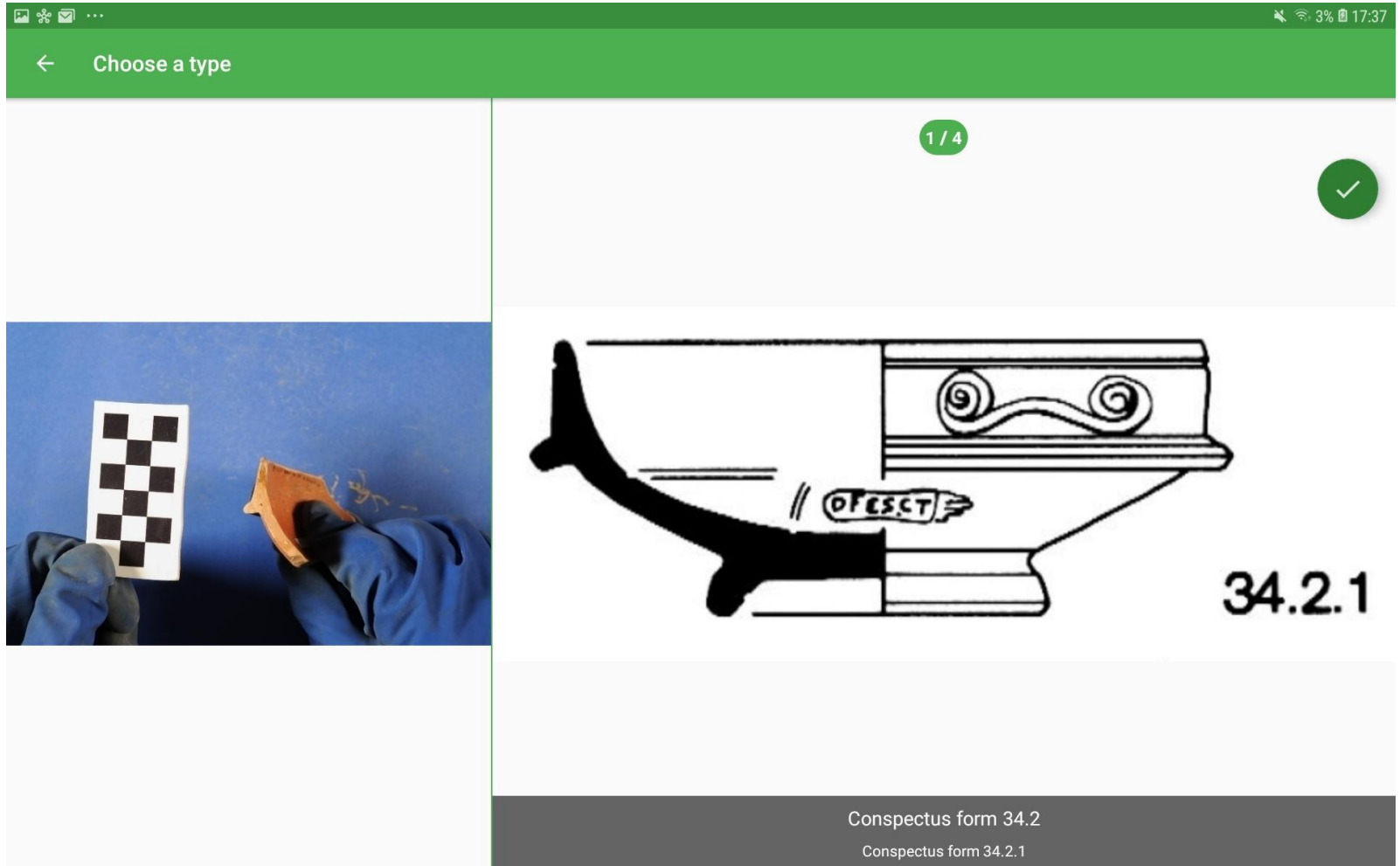
Nothing good? Tap to add manually.





The prediction engine tries to identify only the top level classes. For example, the class “*Conspectus form 34*” is the parent of “*Conspectus form 34.1*” and “*Conspectus form 34.2*”







[Data preservation]

ArchAIDE is participating in the **Open Research Data Pilot**
 The data created will be preserved and disseminated online, and made freely available for use and re-use.

The diagram, titled "The Open Research Data Pilot", features a large arrow pointing right, divided into three colored sections: a dark blue section on the left, a yellow section on top, and a light blue section on the bottom. The dark blue section contains the text "Horizon 2020" and "limited and flexible pilot", followed by two bullet points: "Foster Open Science: transparency, effectiveness and greater impact" and "Avoid duplication of research and loss of resources". The yellow section contains "Data Management Planning". The light blue section contains "Open Access to research data". The background includes the OpenAIRE logo, a map of Europe, and silhouettes of people. Logos for the European Commission and Horizon 2020 are in the bottom left, and a small number "3" is in the bottom right.

We created a Data Management Plan (DMP) , following Guidelines on FAIR Data Management in Horizon 2020

- Open Access
- Interoperability (Open formats, metadata)

At the end of the project, all data within the Reference database (catalogue data, images, models etc), and a subset of data from the Results database will be available within ADS archive, accompanied by rich metadata permitting wide array of re-use.

<https://doi.org/10.5284/1050896>

[Thank you for your attention]

www.archaide.eu



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The views and opinions expressed in this presentation are the sole responsibility of the authors and do not necessarily

reflect the views of the European Commission.