

# Talk Outline

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## Experiences of Cultural Heritage Digital Ecosystems between Research and Communication

### I-Media-Cities

Eu Horizon 2020 research and innovation programme  
Grant agreement N° 693559

### Isabella d'Este Virtual Studiolo

A digital ecosystem can be defined as a **distributed, adaptive, open socio-technical system** with properties of self-organisation, scalability and sustainability inspired from natural ecosystems

DCEs (**Digital Cultural Ecosystems**) can enable new research and foster the process of democratization dissemination of knowledge.



# IDEA

ISABELLA D'ESTE  
ARCHIVE



<http://isabelladeste.web.unc.edu/>



Mantova

IDEA project

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# Isabella d'Este Virtual Studiolo

*Già Direttore dell'Archivio di Stato  
di Mantova e di Milano*

# Isabella d'Este Virtual Studiolo

## concept video demo assets



VISIT LAB  
VISUAL INFORMATION  
TECHNOLOGY LAB  
CINECA

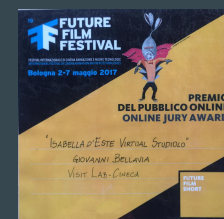


UNIVERSITY OF CALIFORNIA  
SANTA CRUZ



# Isabella d'Este Virtual studiolo

<http://ideaart.web.unc.edu/the-virtual-studiolo/>



# Photogrammetry

## Studiolo

574 photos aligned

110,945,015 point in the dense cloud

11 million **vertices** model

8 \* 4096\*4096 pixel **textures**;

## Grotta

620 photos, 492 aligned

122,408,100 point in the dense cloud

12 million **vertices** model

4 \* 4096\*4096 pixel **textures**;

## Blender Optimization

## Mesh Decimation



Reference

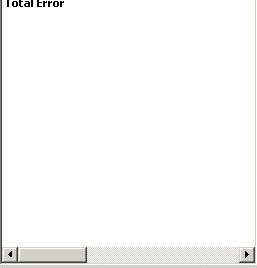


Cameras X (m)

- DSC\_10...
- DSC\_13...
- DSC\_15...
- DSC\_12...
- DSC\_13...
- DSC\_10...
- DSC\_14...
- DSC\_15...
- DSC\_13...
- DSC\_12...
- DSC\_11...
- DSC\_10...
- DSC\_15...
- DSC\_15...
- DSC\_14...
- DSC\_10...
- DSC\_10...

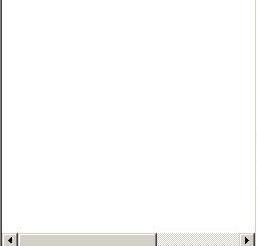
Markers X (m)

Total Error



Scale Bars Distance (m) Accu

Total Error



Workspace Reference

Photos Console



Model

Perspective 95°



Photos



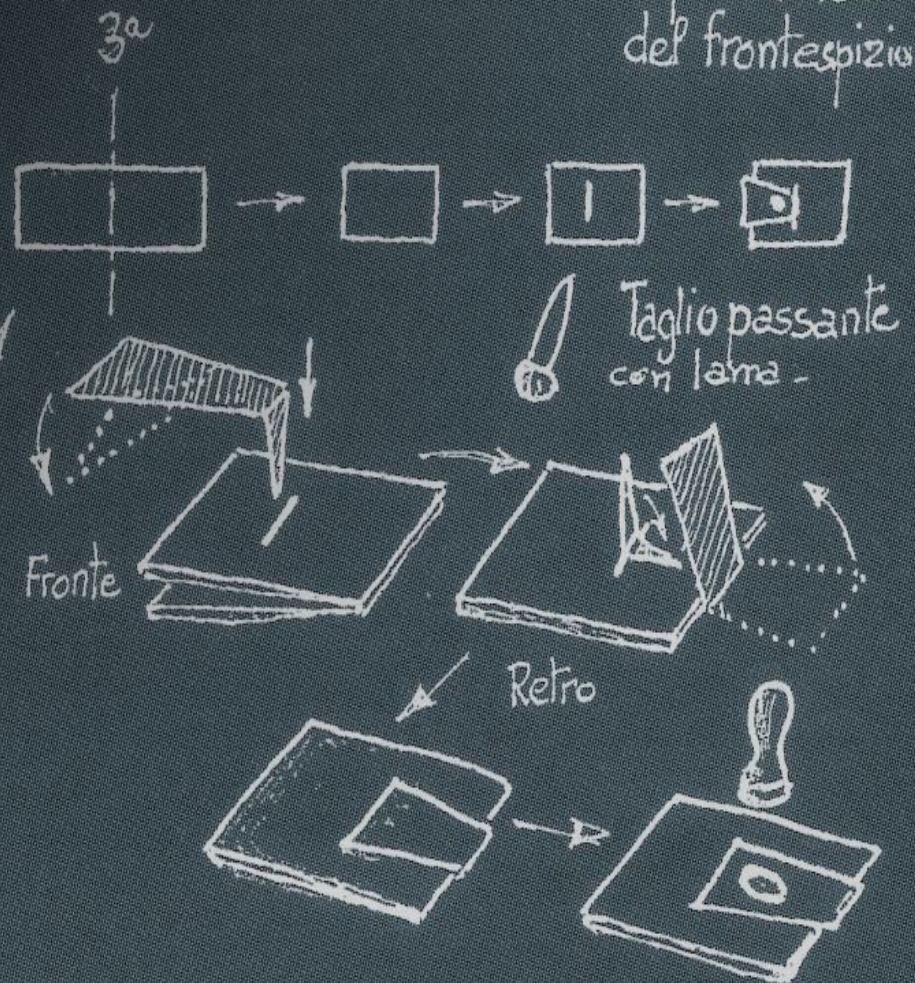
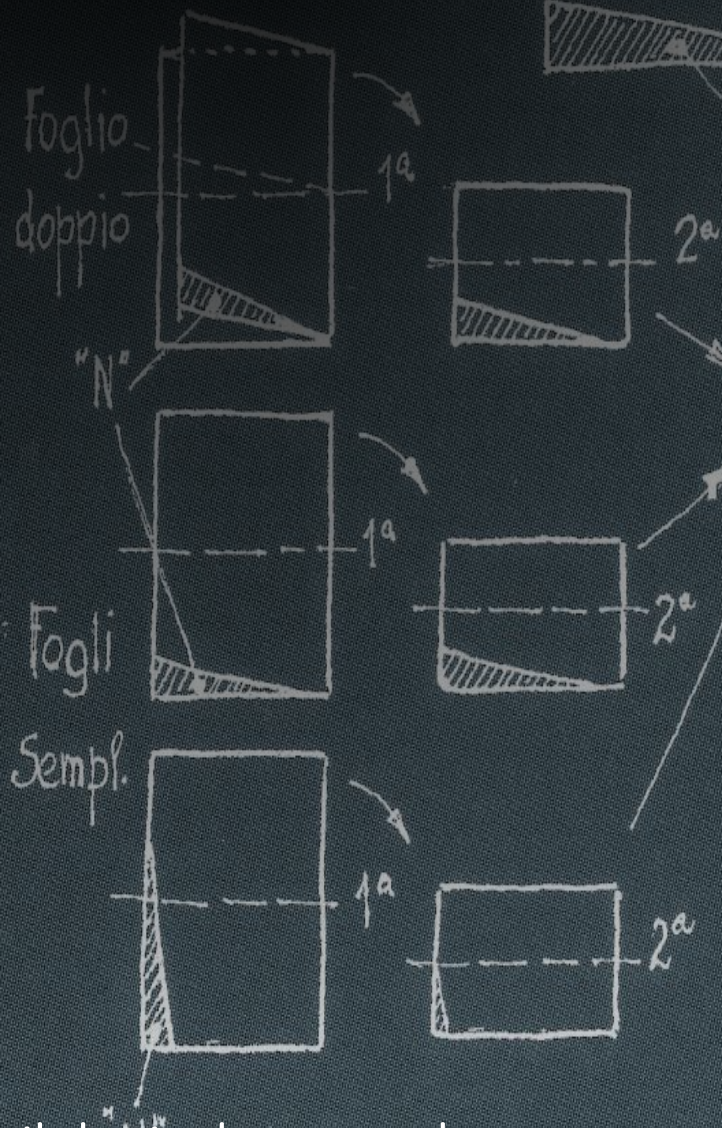
Photos Console



Realizzazione della Nizza dallo stesso foglio



Aspetto finale  
del frontespizio



philological approach

## Milestone 1. The space.

## Next stages Isabella Virtual Studiolo NHE Grant

Deliverable: a **landing page** containing our **3D model of the empty studiolo and grotta**.

Obtain **additional photogrammetry** of studiolo elements (intarsia cabinets, niches)

Build **simulation of the studiolo floor**, using additional surviving tiles.

Insert **a tool** that will permit users **to take measurements** of the studiolo space.

Enable **virtual simulation and hiding of architectural elements** that were added over time.

Include **a time slider** that marks the historical arrival of features and contents in studiolo.

**Simulate lighting** at different times of day within the Virtual Studiolo.

Produce **3D VR visualization of the space for headsets**.

**Research objectives:** Begin to understand the studiolo as an architectural space. Compare Brown's diagrams and measurements of the studiolo with those that emerge from our work. Create the conditions for study of the studiolo's contents in proportion to their original space

## Milestone 2. The statuettes.

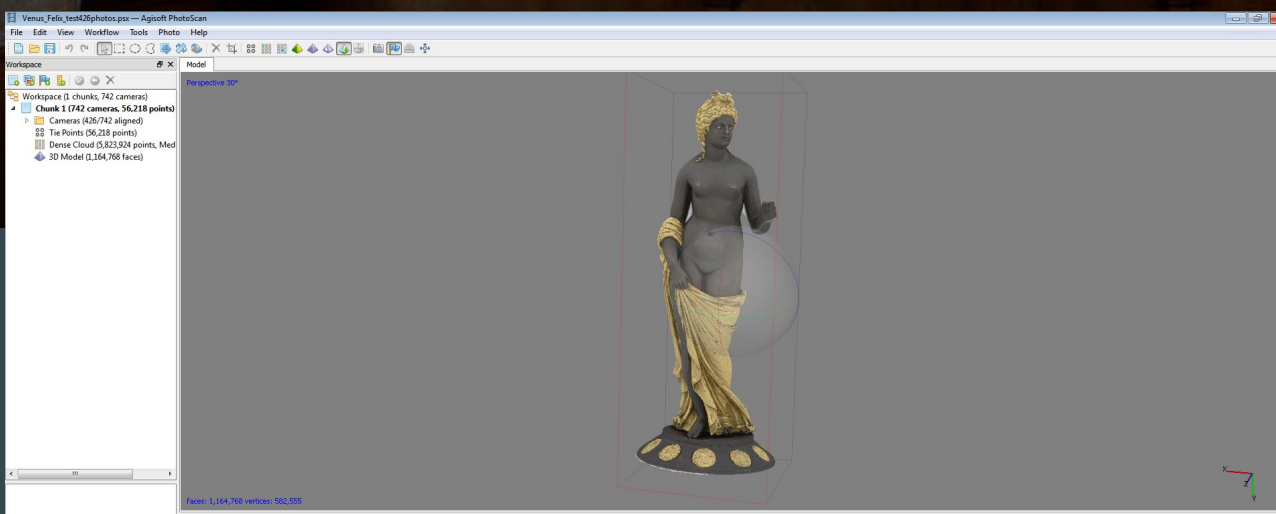
## Next stages Isabella Virtual Studiolo NHE Grant

Using the KHM photographs, begin constructing a **repository of 3D objects** that may be inserted and positioned by users in the Virtual Studiolo space.

Based on the additional photogrammetry campaign of Milestone 1, locate this repository visually in one of the intarsia cabinets of the Virtual Studiolo.

Test ways of moving and placing the statuettes in different studiolo locations

**Research objectives: Enable study of these objects' scale in context, and of potential narrative relations between them and their space.** Create the conditions for interactive study of the statuettes in relation to other contents





Void (Hyper - Reality) concept

# References

<https://cineca.academia.edu/AntonellaGuidazzoli>

[https://www.researchgate.net/profile/Antonella\\_Guidazzoli](https://www.researchgate.net/profile/Antonella_Guidazzoli)



# I-Media-Cities and Digital Cultural Ecosystems



DISCOVER I-MEDIA-CITIES

I-Media-Cities is a research collaboration between

9

European audiovisual  
archives

6

Research institutions

2

Technological providers

1

Specialist in digital  
business models

I-Media-Cities is an ambitious and innovative research project that aims at providing access to historically unique digital films and photos of 9 European cities, inviting new approaches to multidisciplinary research on this content, while also stimulating business innovation and improving overall accessibility of European cultural heritage.



<http://imediacities.eu/>

To provide to  
**Researchers and  
citizens** a platform  
where **access to large  
collections of EU Cities**

To implement an  
**innovative tool for  
metadata  
management**

to implement a **semantic  
search engine for the  
discovery of information  
at shot, segment and  
frame level**

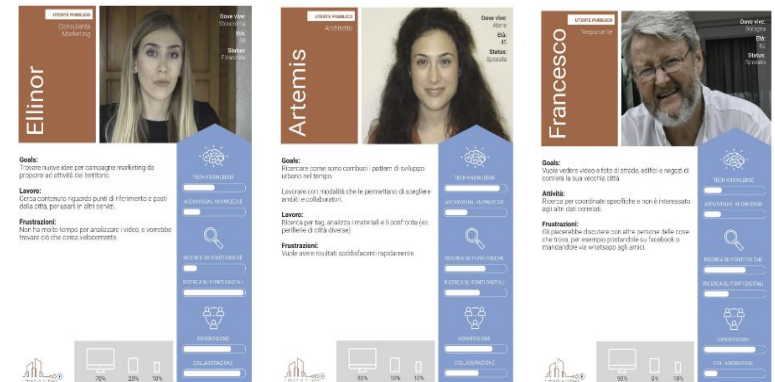
to integrate **AI and  
Deep learning tools**  
for the **automatic shot  
and annotation  
detections**

To provide users with  
**new levels of  
interactivity, allowing  
tagging and  
annotation**

To design and  
implement **new ways  
of dynamically  
displaying and  
visualizing rich AV  
content and metadata**

## Agile methodology

## Visual Interfaces - UX Design

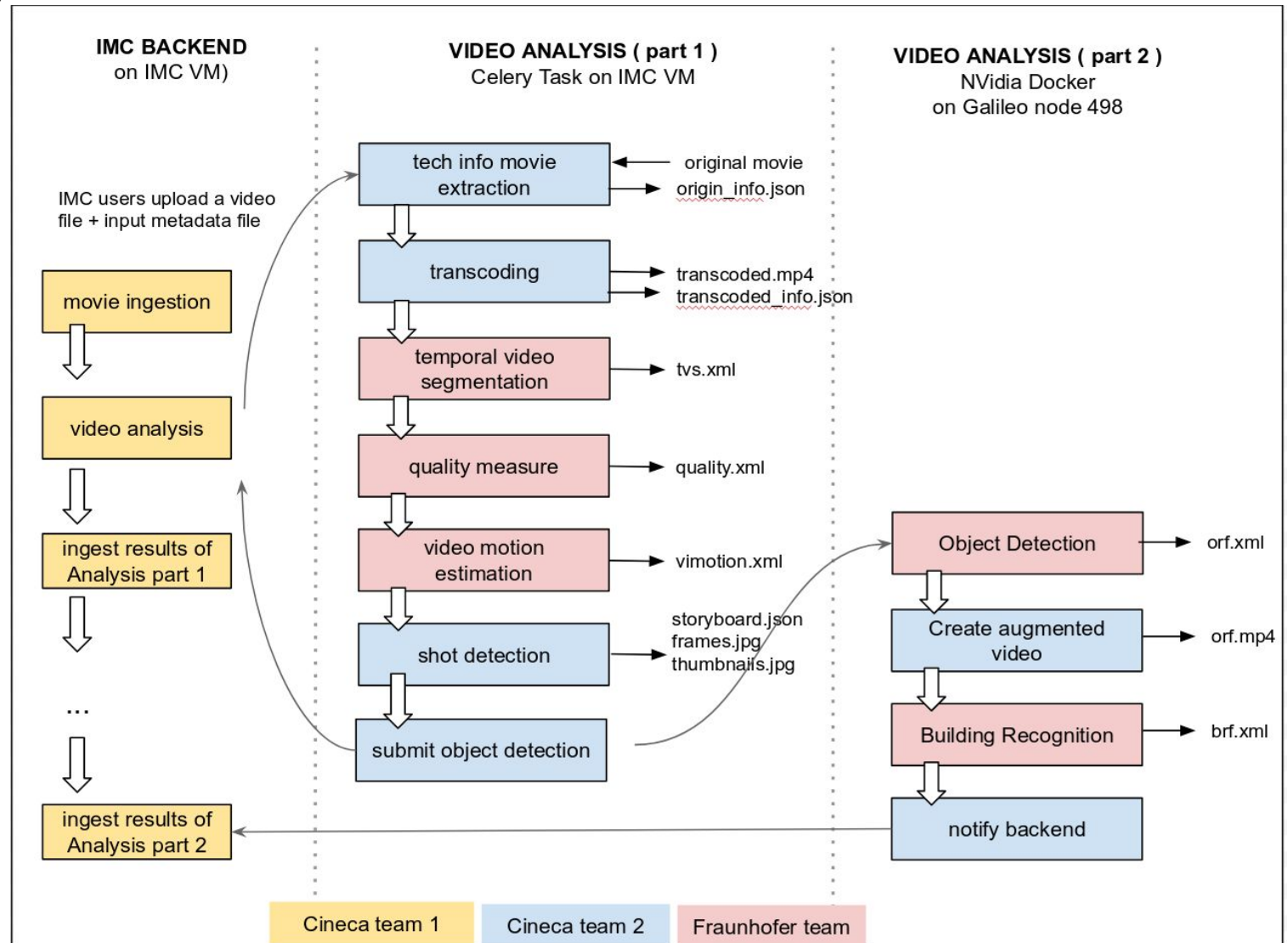


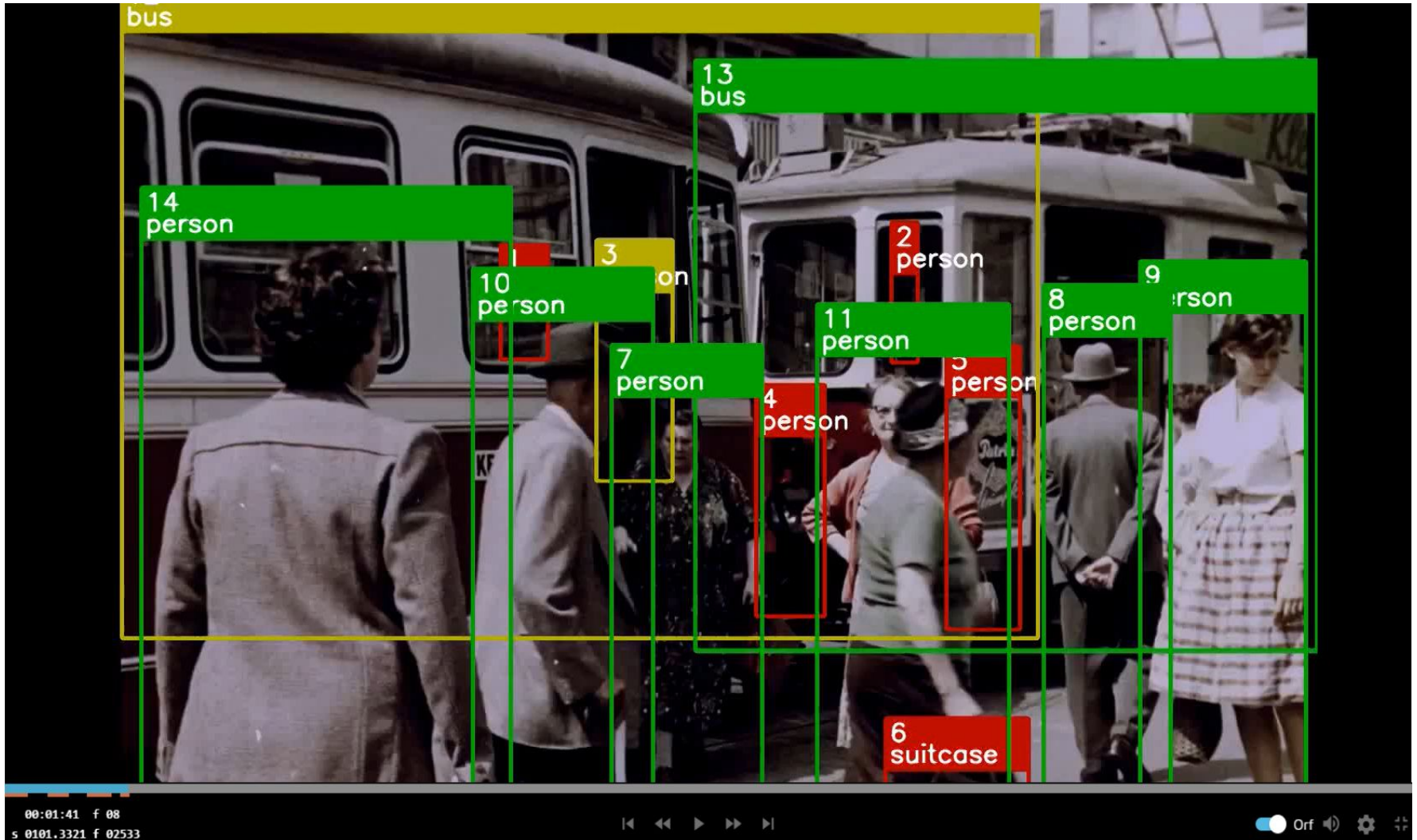
# IMC current catalogue

Archive	City	Object Type	Goal	Current status	Percentage
CRB	Brussels	Video	425	125	29,41%
CCB	Bologna	Video	188	194	103,19%
CCB	Bologna	Image	8.000	7976	99,70%
MNC	Turin	Video	48	54	112,50%
MNC	Turin	Image	300	459	153,00%
OFM	Vienna	Video	80	80	100,00%
FDC	Barcelona	Video	128	124	96,09%
SFI	Stockholm	Video	113	103	91,15%
TTE	Athens	Video	57	50	87,72%
TTE	Athens	Image	1.040	376	36,15%
DIF	Frankfurt	Video	40	13	32,50%
DIF	Frankfurt	Image	500	423	84,60%
DFI	Copenhagen	Video	20	22	110,00%

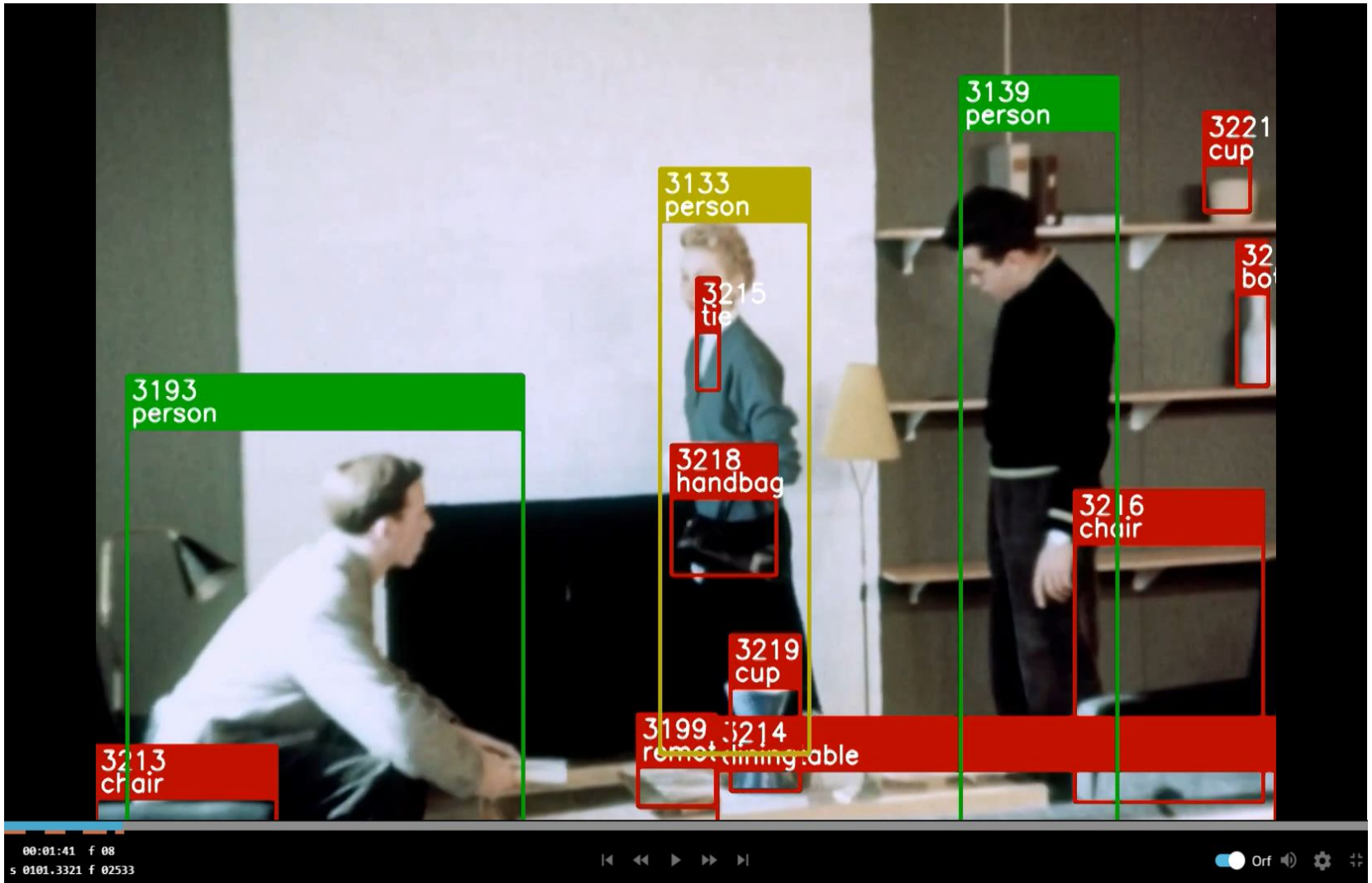


# IMC Movie Processing Pipeline





# HPC and Deep Learning



# I-Media-Cities

manual annotations vs automatic annotations



**9,999 processed elements 14.208 Cpu hours**

## Annotated Terms

Manual annotations	59457	1708
Automatic annotations	422123	78
Geotags	6411	1091

# Experiences of Cultural Heritage Digital Ecosystems between Research and Communication

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