

# Bits, Beams & Beauty: The INFN-CHNet Conference on Digital Tools for Cultural Heritage



**Thursday, 5 March 2026 - Friday, 6 March 2026**

**Roma Tre**

## Scientific Programme

The scientific programme of Bits, Beams & Beauty reflects the interdisciplinary mission of the INFN-CHNet network, bringing together expertise in physics, chemistry, materials science and data science to address current challenges in cultural heritage research.

The conference is structured around three thematic pillars — Bits, Beams, and Beauty — highlighting the full research workflow from advanced data acquisition to digital processing and heritage interpretation.

### **Bits: Digital tools, data analysis and artificial intelligence for cultural heritage**

This session focuses on computational methodologies and digital infrastructures supporting heritage science.

Topics include:

Digital services and competence centres for cultural heritage

- Development of digital twins and virtual research environments
- Advanced data processing workflows for MA-XRF and multimodal datasets
- GPU-accelerated clustering and machine learning approaches
- AI-driven classification and reconstruction of archaeological fragments
- Intelligent tools for large-scale data interpretation and management

The session emphasizes the transformation of raw experimental data into structured, accessible, and interpretable information through advanced algorithms and integrated digital ecosystems.

### **Beams: Advanced diagnostics and instrumentation**

The Beams session explores the experimental techniques and infrastructures that generate high-quality analytical data for cultural heritage studies.

Contributions cover:

- On-site and laboratory-based X-ray scanning methodologies
- Neutron-based diagnostics and calibration strategies
- Muon imaging applications in heritage science
- Development of beam-based technologies at different energies
- Calibration protocols for neutron techniques applied to archaeological materials

Particular attention is given to instrumentation development, methodological standardisation, and the integration of complementary probing techniques within end-to-end analytical workflows.

### **Beauty: Integrated approaches for artworks and archaeological materials**

The Beauty session presents case studies and multimodal approaches aimed at the understanding, conservation, and valorisation of cultural heritage.

Topics include:

- Automated 3D scanning systems for multimodal analysis
- Integrated isotopic and archaeometric investigations
- Phase-contrast X-ray imaging systems for laboratory applications
- Multi-scale analytical strategies combining X-ray and infrared techniques

Cross-disciplinary methodologies linking diagnostics, materials science, and interpretation

This session highlights how the combination of beams and bits ultimately contributes to revealing the historical, material, and aesthetic dimensions of cultural heritage.

## **Bits: Digital tools, data analysis and artificial intelligence for cultural heritage**

14:35 - 15:35

**Track chair:** Lisa Castelli

## **Beams: Advanced diagnostics and instrumentation**

15:40 - 17:00

**Track chair:** Massimiliano Clemenza, Alessandro Re

## **Beauty: Integrated approaches for artworks and archaeological materials**

17:20 - 19:00

**Track chair:** Valerio Graziani