

2021-2022 REPORT (2ND YEAR ACTIVITIES)

UNIVERSITY OF OXFORD, TORCH

# (EN)CODING HERITAGE NETWORK



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**PREPARED BY:**

LISANDRA (LIA) COSTINER  
NETWORK LEAD

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# NETWORK TEAM

## CORE FOUNDING MEMBERS



**LISANDRA (LIA) COSTINER**  
FOUNDER & LEAD  
HISTORY OF ART



**RICHARD SMITH**  
GLAM: BODLEIAN LIBRARY



**KATHRYN ECCLES**  
OXFORD INTERNET INSTITUTE



**KATHRIN WILHELM**  
GEOGRAPHY



**GIOVANNI PALA**  
HISTORY



**EMANUELA VAI**  
MUSIC



**MATTHEW NICHOLLS**  
CLASSICS



**ELIZABETH FROOD**  
ORIENTAL STUDIES



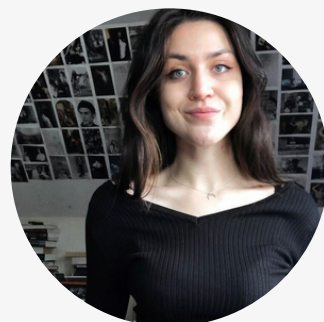
**AMANDA WESCOTT**  
HISTORY



**TAYLOR BENNETT**  
ARCHAEOLOGY



**PAUL DOHERTY**  
ORIENTAL STUDIES



**LENA SZALEWSKA**  
HISTORY

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# OVERVIEW



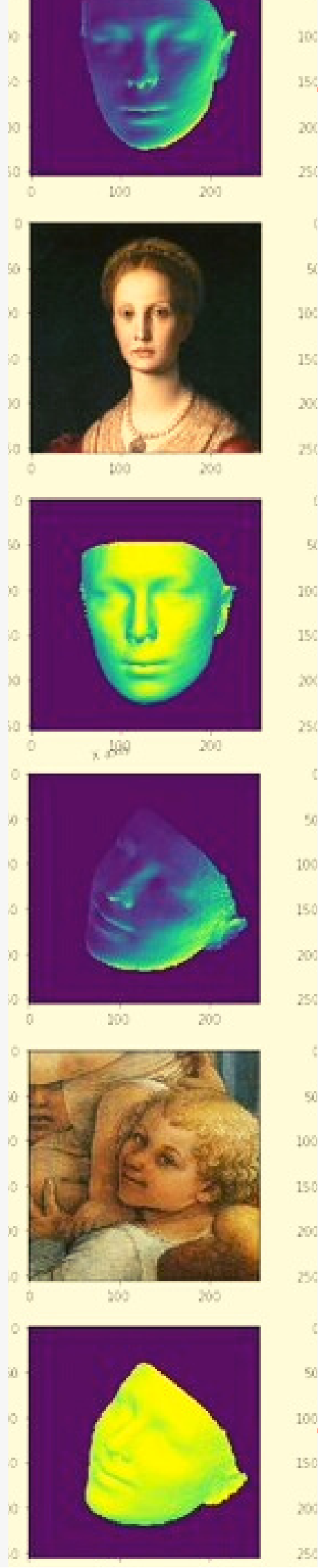
New visual computing technologies, such as 3D mapping and photogrammetry, capture highly accurate reproductions of artefacts, historical structures and sites. Augmented and virtual reality enables interaction and exploration of these reproductions 'first-hand'. These powerful tools are already being integrated into research and becoming central to academic study. Their ability to record millimetre-precise, photo-realistic 3D models enables the safeguarding of cultural heritage otherwise threatened by war, erosion, climate change and degradation. Such technology also increases access to material culture and heritage sites: it brings distant monuments to new audiences and enables researchers to study artefacts or sites remotely, from new perspectives (in higher resolution, under different lighting and environmental conditions, through cross-sections and other view-points, across time etc.).

The aim of this network is to connect scholars from the humanities, social sciences and applied sciences interested in harnessing the power of 3D mapping, photogrammetry and virtual environments in their research. Collectively, this network will explore and test the benefits or limitations of technological approaches for studying historical records, material objects and cultural sites, and chart new paths of exploring our past and shared heritage.

The network was funded in 2020 with the support of TORCH. Its organising committee consists of twelve members, while the mailing list spans over 350 individuals.

**[www.torch.ox.ac.uk/encoding-heritage](http://www.torch.ox.ac.uk/encoding-heritage)**





# CONFERENCE

## DIGITAL APPROACHES TO ART HISTORY AND CULTURAL HERITAGE

4-5 MARCH 2021, OXFORD

This conference brought together researchers, students, and professionals from art history, museology, digital humanities, geography, history, archeology, classics and computer science, with a shared interest in digital approaches to the study of visual and material culture. The goal was to collectively explore how researchers integrate digital tools into their research, introduce new audiences to cutting edge technologies and methodologies, and critically assesses the opportunities and challenges that such approaches present.

The event was organised by Lia Costiner (Merton College, Oxford) & Leonardo Impett (Durham University). Thirty-three international speakers presented their research to an audience of over 100 members.

The conference spanned two days, each dedicated to one of the following themes:

**Digital Approaches to Art History (Digital Visual Studies).** The theme extends to digital and computational approaches to the study of visual culture. Topics include: digital imaging, computer vision, network analysis, visual Distant Reading, digital research infrastructures, data standards, institutional projects, digitisation and digital publishing projects.

**Digital Approaches to Architectural and Cultural Heritage (Sites and Objects)** The focus is on three-dimensional cultural sites and objects. This includes data capture, 3D and 4D modelling, and virtual anastylosis. It likewise treats the display, exploration and research of cultural heritage sites using new technologies, including but not limited to virtual and augmented reality.



# Digital Approaches to Art History & Cultural Heritage

4-5 MARCH 2021 • UNIVERSITY OF OXFORD

## CONFERENCE PROGRAMME

### Thursday 4th

10:00 Lia Costiner & Leonardo  
Impett

10:15 Anna Luise Schubert

10:30 Clemens Brünenberg

10:45 Joana Pinho

11:00

11:15 Marco Sosa & Lina Ahmad

11:30 Krupali Uplekar Krusche

11:45 Marco Carpićeci & Fabio  
Colonnese

12:00

16:05 Chair

16:10 Chiara Capulli, Fabrizio  
Nevola, Luca Brunke, Donal  
Cooper

16:25 Ciprian Firea

16:40 Dawn Kanter

16:55

17:15 Maria Giulia Dondero

17:30 Pierre-Emmanuel Perrier de La  
Bâthie

17:45 Sarah Griffin

18:00

### 3D, Architectural and Urban History

Opening Remarks

The Matter of Data. Architecture as Navigational Device

Augmented Reconstruction. On Introducing a new  
Reconstruction Method for Cultural Heritage Sites Using  
Mixed Realities

«Hospitalis»: a digital art history project for the study and  
valorization of welfare architecture

*Coffee Break*

Pedagogy Initiative; Recording Architectural and Cultural  
Heritage in the United Arab Emirates

3D Analysis of Cultural Heritage as a tool for architectural,  
historical, and archeological research – 3D Mapping the  
Roman Forum, Rome, Italy

From ideal to true form. Digital photogrammetry as a new  
paradigm of knowledge

*End session*

### New Approaches to Visual Art

Welcome

Reconstructing Florentine church interiors: notes from the  
field

Morellian analysis in a new era. Digitally approaching  
Transylvanian Renaissance painting in connection with  
Nuremberg art in the time of Dürer

A digital approach to the portrait-sitting as a research object  
for art historians

*Coffee Break*

A Genealogy of Forms. From Warburg and Focillon to  
Computational Analysis

What do Photographs of Artists Circulating on the Internet tell  
Us?

Quantifying the use of materials in objects across the  
Metropolitan Museum of Art, New York

*End session*

# Digital Approaches to Art History & Cultural Heritage

4-5 MARCH 2021 • UNIVERSITY OF OXFORD

## CONFERENCE PROGRAMME

### Friday 5th

10:05 Chair  
10:10 Dominik Lengyel & Catherine  
Toulouse

10:25 Amanda Wasielewski & Anna  
Dahlgren

10:40 Annette Loeseke

10:55

11:15 Fabian Offert

11:30 Servajean Maximilien

11:45 Lev Manovich

12:00

16:05 Chair

16:10 Ellen Prokop

16:25 Eugene Han

16:40 Jean-Philippe Échard

16:55

17:05 Lauryn Smith

17:20 M.W.A. Wijntjes, M.J.P van  
Zuijlen & F. Di Cicco

17:35 Michael McMaster

17:50 Lia Costiner & Leonardo  
Impett

18:00

### Critical and Reflexive Methodologies

Welcome

Visualisation as a Research Tool in the Digital Humanities

New Datasets, Old Mindsets: Quantifying and Contextualizing  
Digital Approaches in Art History

The digital generation of 'cultural heritage': curatorial blind  
spots in the panorama exhibition at Berlin's Pergamon  
Museum.

*Coffee Break*

"A Painting of a Murder in the Style of Monet". Applications  
and Limitations of Large-scale Contrastive Pre-Training in  
Digital Visual Studies

On the use of Artificial Intelligence in Digital Humanities: an  
Application in Art History

Towards an Alternative Digital Art History

*End session*

### New Methods, New Techniques

Welcome

AI and the Digital Archive

Reconstructing aesthetic encounters using spatial eye-tracking

Towards digital reconstruction of lost signs borne by heritage  
artefacts using chemical imaging: the case of 16th-c. violins and  
luthiers' tools

*Coffee Break*

Discerning the Painter's Hand Part II: Next Steps and  
Implications of Artificial Intelligence-based Attributions

Geometrical annotations for the analysis of space and material  
depiction

Discerning the Painter's Hand Part I: A Machine Learning  
Approach to Attribution using the 3D Surface Texture of  
Paintings

Closing Remarks

*End session*

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# (EN)CODING HERITAGE SEMINAR SERIES

TRINITY TERM 2021



The (En)coding Heritage Seminar Series, held online in Trinity Term 2021, brought together researchers working at the cutting edge of digital technologies, humanities and heritage science. Fifteen international speakers described ongoing projects in the field. Topics included digital mapping projects, data visualisation, digital art history/digital visual studies, digital restorations, and new mobile applications for the recoding of architecture and cultural heritage.

Themes of the seminar included:

- Digital Reconstructions and Reactions
- New Directions in Digital Visual Studies
- Mapping Real and Imagined Sites
- Immersive Technology: Transforming Education in the Digital Age

Presentations were recorded and can be viewed on our network site::

**<https://torch.ox.ac.uk/encoding-heritage#tab-1879676>**





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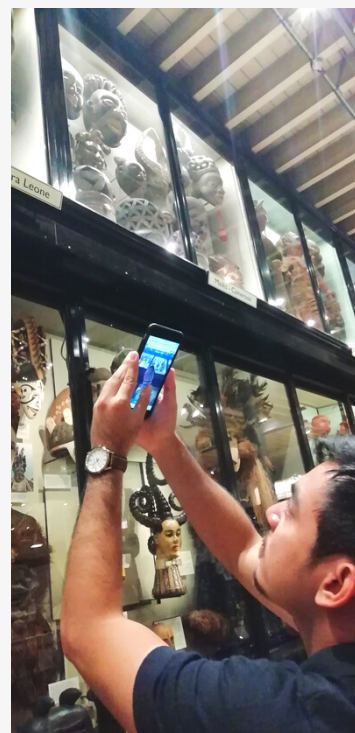
# DIGITAL CULTURAL HERITAGE COURSE

## AT THE 2022 OXFORD DIGITAL HUMANITIES SUMMER SCHOOL



After two years of delivering a taster of our new Digital Cultural Heritage course online, we were able to offer the training in person. We designed and launch the first edition of the course at the Oxford Digital Humanities Summer School in July 2022. In the span of a week, participants were introduced to methods for capturing, analysing, and digitally displaying cultural heritage. Training included the digital capture of objects and the creation of 3D models using photogrammetry, an introduction to creating virtual reality environments using the programme Unity and SketchUp, and a taster of 3D printing technologies. Students also explored immersive technology applications both in the classroom and museum settings (Pitt Rivers Museum).

Fourteen students attended the training, hailing from the UK, Italy, the United States, Spain, the Netherlands, Singapore, and the Philippines. Backgrounds were diverse, ranging from academics (professors), to university support staff, museum professionals, post-doctoral researchers and undergraduate students.



Students participating in the Digital Cultural Heritage Course at the 2022 Digital Humanities at Oxford Summer School.



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# IMMERS-EXPO 2022

## IMMERSIVE RESEARCH & THE METAVERSE



On 20 May 2022, the (En)coding Heritage Network in partnership with the Oxford X-Reality Hub, and Jesus College Digital Hub organised its first in-person event following the pandemic.. This was held at Jesus College Ship Street Conference Centre, in Oxford. The Immers-eXpo: Immersive Research and the Metaverse showcased developments in mixed reality technology in academia and industry. Visitors were invited to learn about advancements in the field, peruse stalls and experience live demonstrations. On display were a number of academic projects being developed at the University of Oxford and other UK institutions, as well as demonstrations from industry leaders.

The event also included a number of lightning talks given by academic and industry partners, which focused on the use of immersive technologies in a variety of disciplines including, sciences, education, medicine, mental health, oriental studies, art, history, and cultural heritage.

The announcement for the event garnered more than 3000 page views, and all tickets sold out. The majority of attendees hailed from the University of Oxford (70%), while the rest (30%) came from outside of Oxford.



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# PROGRAMME

## Academic Talks

*Speakers  
spanned a  
wide range of  
disciplines  
and  
approaches.*

13:30 Sir Nigel Shadbolt

*Welcome*

13:40 Dr Janina Schupp, Mr Richard Smith,  
Dr Lia Costiner

*Introduction to the Hubs*

13:50 Dr Anant Jani

*EdTech in the Cloud: Envisioning the Future of  
Literature Learning*

14:00 Prof Graham Taylor

*Viewing animal flight from the inside out: muscle  
visualizations and visual fields*

14:10 Dr Paul Docherty

*Videogrammetry: Ground based 3D capture of large  
areas using video*

14:20 Prof Shankar Srinivas and Prof Wes Williams

*Shaping Destiny: Experiments in Embodiment*

14:30 Prof William Latham

*Organic Art Forms in VR*

15:30 Dr Sylvia Pan

*Social, Empathic, and Embodied VR*

15:40 Mr Ian Stuart, Avantis Education

*Impact of Immersive experiences in school education*

15:50 Mr Giovanni Pala and Lia Costiner

*Immersive and 3D Tools for the study of Cultural  
Heritage*

16:00 Mr Tim Doubleday, Dimension Studio

*Building entertainment for the metaverse*

16:10 Dr Aitor Rovira

*Virtual reality for mental health therapies*

16:20 Dr Lorenzo Picinali

*Immersive audio for XR*

16:30 Mr Steve Taylor

*Biomedicine in the Metaverse*



## Immers-eXpo 2022



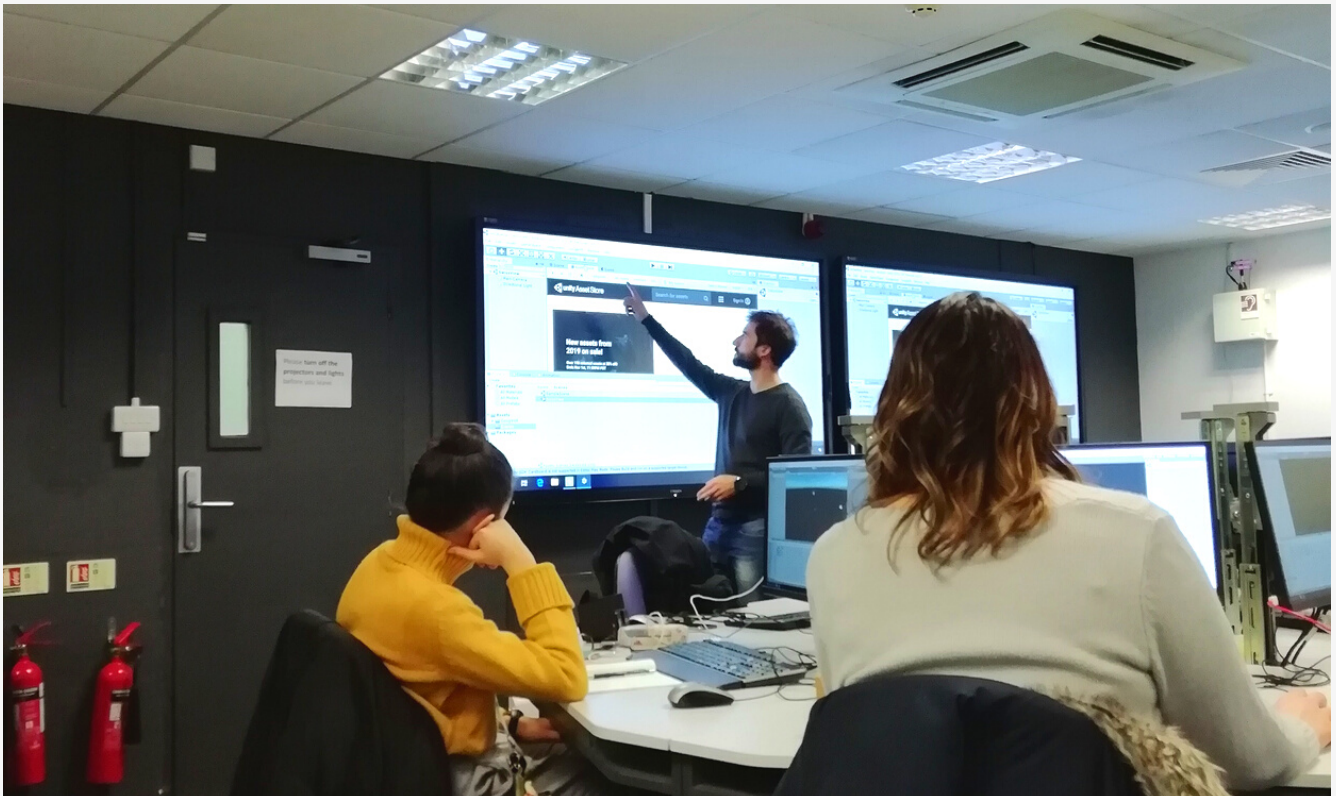
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# TRAINING COURSES

IT SERVICES 2020-PRESENT



Network member, Richard Smith, who also co-leads the Oxford X-Reality Hub, offered termly courses through IT Services, open to network members and the wider university community.

This courses sought to introduce participants to the basics principles of creating virtual and augmented reality applications, using the popular game engine, Unity.

Participants gained experience in working with the key building blocks of the engine (game objects, scenes and prefabs), learned how to import assets into a scene and interact with them using a user interface (UI).

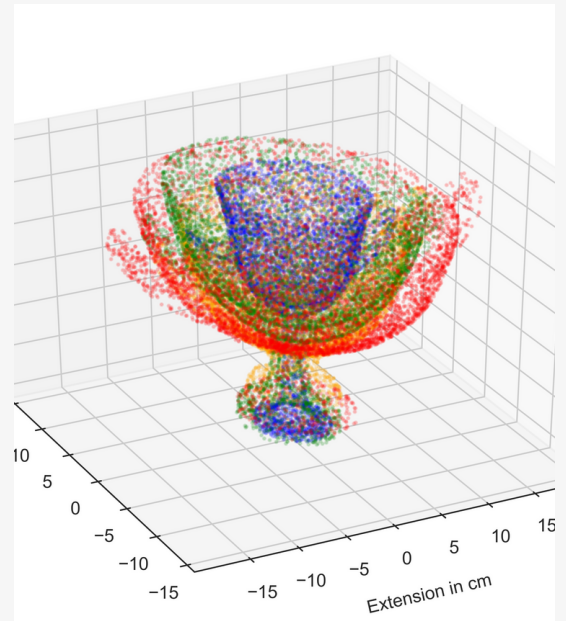
Hundreds of students have attended the training to date, from all disciplinary backgrounds and career levels. Through this, the (En)coding Heritage Network, in partnership with the OXR Hub, sought to empower the Oxford community to integrate new technologies into their research.



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# PROJECTS

## TRACING CHANGES IN SHAPE OF HISTORICAL ARTEFACTS ACROSS TIME USING 3D SCANS



The network also fostered new collaborations in partnership with local museums (The Ashmolean). Network members, Giovanni Pala and Lisandra (Lia) Costiner, partnered on a computational study of artefacts. The project pioneered a new computational approach for the study of changes in shape of Greek pottery across time . Previously, such investigations were undertaken by scholars using a purely visual approach and relied on photographs or in-person observations. This study's approach is based on 3D scans of historical artefacts, namely ancient Greek vessels of the Krater, Pelike, and Kylix types. Results offered, for the first time, a way of quantifying differences between objects. The benefits of this approach lie in its ability to quantify change, study complex 3D material, and to analyse large datasets of objects, opening the possibility of constructing new large-scale studies of object shape across time and geographical regions. These have a range of applications in art history, archaeology, digital humanities, museology and extended reality studies..

The results were published in May 2022 in the Journal of Open Humanities Data: <http://doi.org/10.5334/johd.61>.

# IMMERS-ED GLOBAL HACKATHON

Immers-Ed, the first hackathon at Oxford devoted to Immersive Technologies, took place virtually over the course of one week (27 Sept. - 1 October 2021). Organised by the Oxford X-Reality Hub in collaboration with the TORCH (En)coding Heritage Network, the event, modelled upon programming hackathons, tasked participants with devising solutions to challenges arising from the pandemic in four key areas: Cultural Heritage, Education, Environmental Sustainability, and Healthcare.

International teams composed of participants from eleven countries took part in the event (hailing from Germany, Austria, Slovenia, Saudi Arabia, Turkey, India, the Philippines, U.S.A., Guatemala, Kenya, and the U.K.). Participants benefited from a day of training courses covering the basics of designing immersive experiences, giving them an overview of the creative process, and introducing them to practical tools.

Over the course of 72 hours, each team worked on shaping and developing an idea, guided by a subject specialist from the University of Oxford. Projects were encapsulated into a 4-6 minute presentation which was submitted on the final day of the event. The entries were judged by a panel academics as well as industry leaders.

Winning projects included: in the field of education, the creation of an immersive experience which monitored students' engagement in order to enhance chemistry learning; in the cultural heritage field, a way of exploring a museum remotely using a robot; in medicine, a virtual application for ophthalmological care; and in environmental sustainability, an application which predicts flash floods, prevents damage and saves lives. The Grand Prize winner, Team Atrium, proposed the creation of a mobile application that 'creates a more expansive experience for audiences that exists outside of the physical space of traditional institutions and increases exposure and engagement for artists by inviting participation from viewers through augmented reality.'

The grand prize winner was awarded \$10,000 of Amazon Web Services credit, while each individual challenge winner received a mentorship package from the Oxford X-Reality Hub to assist in the future development of their ideas. This hackathon revealed the power of immersive technologies to tackle challenges in a range of disciplines and the ways in which technology can be harnessed to assist in post-pandemic recovery.

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## IMMERS-ED HACKATHON

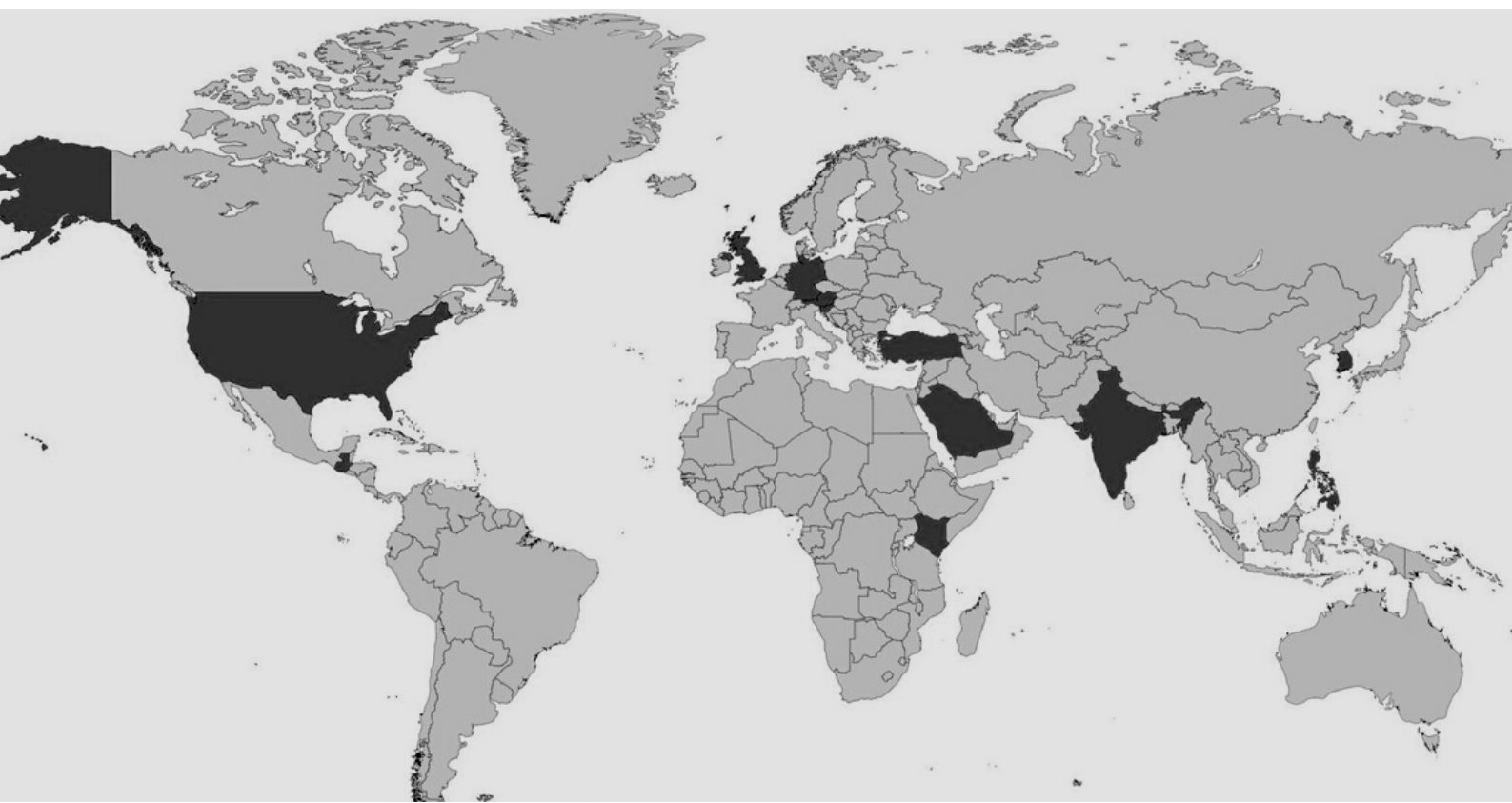
# PARTICIPANTS

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### GLOBAL REACH

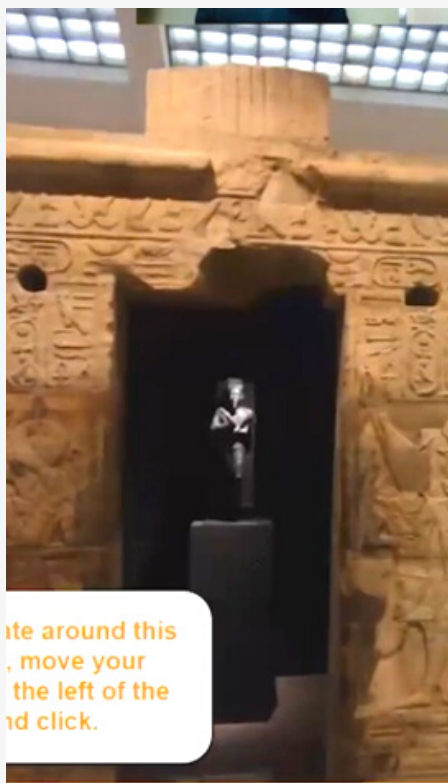
The hackathon attracted 317 applicants from around the globe, of which 180 submitted their applications individually and 137 formed part of 44 teams. After a rigorous selection process, 9 teams were selected to participate, comprising of 41 individuals. These represented eleven countries and four continents. Participants counted the U.K. as their home, Germany, Austria and Slovenia. From the North American continent, the U.S.A. and Guatemala were represented. The event also attracted participants from Africa, Kenya in particular, and from the Middle East, with Saudi Arabia. The Asian continent was represented by Turkey, India, South Korea and the Philippines.

The hackathon included participants at different career stages: undergraduates, Masters and doctoral students, senior academics, artists and professionals. The group was gender balanced, due entirely to self-selection. Of the 41 participants, more than half, 21, were female.





## HACKATHON: CHALLENGE WINNERS



### CULTURAL HERITAGE

#### Museums of The Future

developed by **Team Culture Crunch**

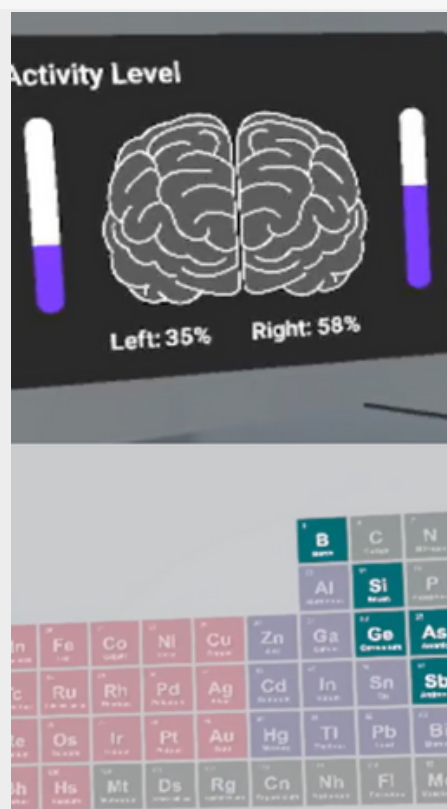
**Crunch** is an immersive learning experience within the museum setting. It proposes a live virtual tour of a museum space using a robot that is remote-controlled by the learner, encouraging engagement with individual museum objects through gamification, from the comfort of one's home.

### EDUCATION

#### Chemist's Interactive Lab

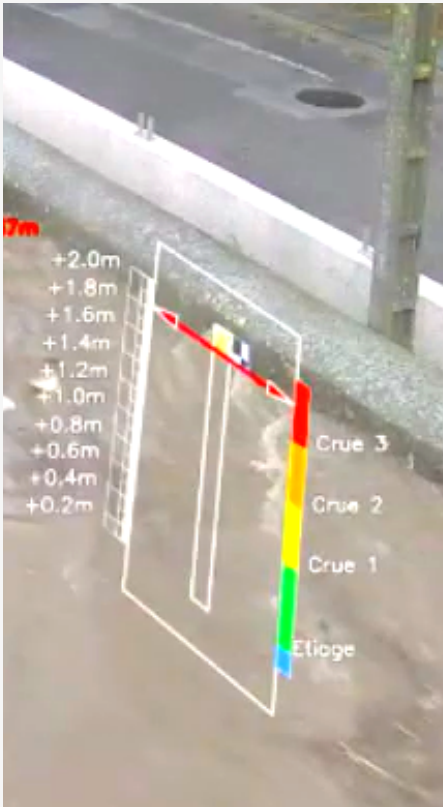
created by **Team C.I.I.L**

**Developers** addresses the disruptions in education wrought by the pandemic. It creates a virtual reality learning experience that measures attention and EEG activity simultaneously to promote engagement and retention of chemistry material.



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## HACKATHON CHALLENGE WINNERS

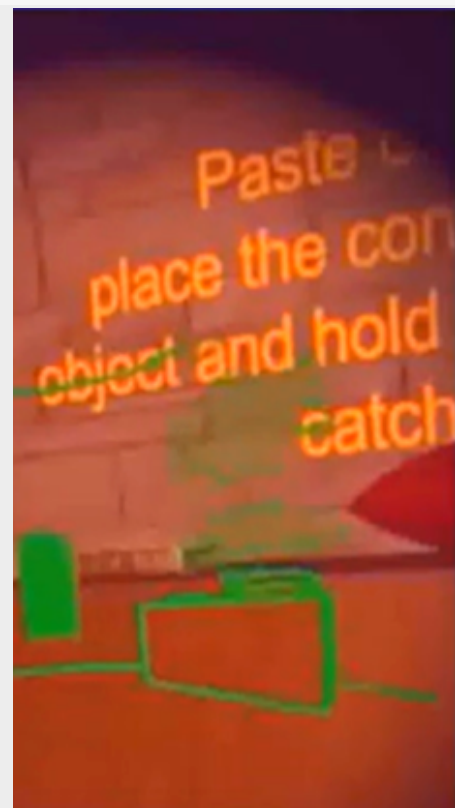


### ENVIRONMENTAL SUSTAINABILITY

**Flood Alerting System** created by **Team Hacked Insights** addresses an environmental challenge linked to global warming. The project proposes a mobile application that predicts flash floods, unpredictable occurrences that are prevalent in South Asian countries. It reduces the damage caused by these and saves lives.

### HEALTHCARE

**Havik Eye** designed by **Team Novum Initium** redesigns ophthalmological care. It uses Virtual Reality and Augmented Reality to deliver therapy through stimulation and immersion. The application is remote, widening accessibility to healthcare and eliminating the need to travel to medical appointments.

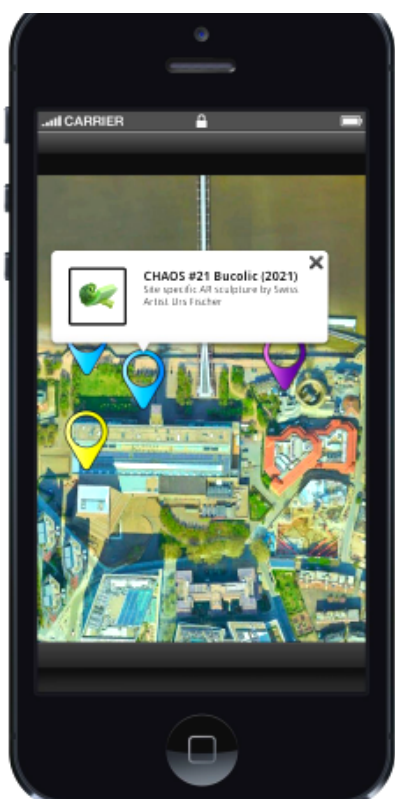


## IMMERS-ED HACKATHON

# GRAND PRIZE WINNER

Team Atrium

The grand prize winner of the 2021 Immers-Ed Hackathon, **Atrium**, designed by **Team Atrium**, revolutionises audiences' experience of artworks. It proposes the creation of a mobile application that 'creates a more expansive experience for audiences that exists outside of the physical space of traditional institutions and increases exposure and engagement for artists by inviting participation from viewers through augmented reality.'





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