



SEAHA

EPSRC CENTRE FOR DOCTORAL TRAINING
SCIENCE AND ENGINEERING IN
ARTS HERITAGE AND ARCHAEOLOGY

SEAHA Studentship: 3D 5G Immersive Audio for Urban Outdoor Heritage Contexts

The EPSRC Centre for Doctoral Training in [Science and Engineering in Arts, Heritage and Archaeology](#) at University College London, University of Oxford and University of Brighton, in collaboration with [Echoes](#) and [The Regency Town House](#) are seeking applications for a fully funded studentship on the topic **3D 5G Immersive Audio for Urban Outdoor Heritage Contexts** Funded by the Engineering and Physical Sciences Research Council (EPSRC) through the SEAHA Centre for Doctoral Training and co-funded by the University of Brighton, the four-year doctoral research project will be supervised jointly by UCL Institute for Sustainable Heritage, the University of Brighton and representatives from the collaborators.

This project will address a research gap concerning the understanding of the combined use of 3D and 5G technologies to engage heritage audiences. The project will be novel in approach in that it will use a combination of 3D immersive audio and 5G technology to create heritage-specific content and to develop new audiences for the heritage sector. It will create a prototype environment for the creation, curation and dissemination of heritage-specific 3D audio. For this, it will combine the Innovate UK funded Brighton Digital Catapult 5G testbed for high-speed content streaming and low latency, Google Resonance Audio tools for 3D sound, the Echoes Creator for geolocative sound and outdoor Heritage locations in Brighton. This will work with ambisonics, user location, head-related transfer function (HRTF), environmental modelling to provide accurate convolution reverbs to provide immersive experiences, streaming multi-channel ambisonic audio, 5G technology and other emerging relevant audio and mobile technology. It will advance scientific solutions for achieving low latency spatial audio with 5G. A co-creation methodology will engage audiences and heritage partners throughout the design, production and evaluation process.

The project will analyse the user experience of heritage content when walking around urban outdoor heritage sites (e.g. Brunswick Square in Brighton) with specific headphones linked to a smartphone. They would listen a 3D sonic experience designed to convey information about the specific heritage context (including sounds, music and spoken words), something that could be imagined as an experience that includes features of 3D computer game sound, GPS sound walks, guided heritage tours and immersive AR/VR experiences.

This builds on existing research undertaken at Brighton on 3D immersive audio technology, GPS audio for heritage sector, 5G immersive experiences, augmented reality and cultural/heritage audience development through mobile/digital technologies (e.g. NetPark).

The project aims to address the following **research questions**:

RQ1: What kind of heritage-specific content emerges through experimentation with 3D immersive audio in a 5G testbed?

RQ2: How could this help heritage institutions to engage new audiences and to understand in detail how they behave near cultural heritage (user movement, location, interaction data)?

RQ3: How do audiences experience heritage engagement when delivered through immersive 3D audio in public/urban spaces?



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RQ4: What does a prototype public lab for the creation, curation and dissemination of 3D immersive audio look like and what can the heritage sector learn from it?

Methodology

Following a literature review, this project involves a 2-step experimentation phase to create a working setup/prototype environment. In the first step, this involves engaging with the key emerging technologies individually, including Echoes (<https://echoes.xyz/>), Google's Resonance Audio (<https://developers.google.com/resonance-audio/>)

and the 5G testbed (<https://www.digitalcatapultcentre.org.uk/tag/5g-brighton-testbed/>), reviewing different HRTF techniques/models to find the best match for sonic AR, testing different IMUs (inertial measurement unit) to find the most accurate head-tracking technologies. The second step links these technologies, for example using multi-channel ambisonic (360°) recordings in a locative context to provide soundscapes which react to the orientation of the listener, combining ambisonics and location to enable users to move between ambisonic recordings, working with environmental modelling to provide accurate convolution reverbs to provide immersive experiences, streaming high-resolution 3D sound (4-16 channels) via 4G and 5G technology. This makes a contribution to achieving low latency spatial audio with 5G.

Co-design (beyond user-centred/ux design) will be a key feature of the methodology, including co-creation workshops with heritage and industry partners as well as members of the public (potential audiences). The 3D heritage audio content will be developed through an iterative process that includes user testing at all stages. The analysis of user data (movement, location, interaction) will also be key and will be done in R. Qualitative audience responses will also be collected (questionnaires or focus groups, observations) and the analysis will include triangulation between quantitative user data and qualitative audience response data. Overall, this methodology creates a prototype public lab for the creation, curation and dissemination of 3D immersive audio for the heritage sector.

The role of the University of Brighton is to lead and oversee the project, including academic and methodological rigour, and to provide access to its sound studios. The role of the heritage partner 'The Regency Town House' is to provide information and data about the heritage context of the prototype location (Brunswick Square) and to support co-design workshops and content creation. The role of the Industry partner is to provide technical insights and support into the audio technology and processes. The role of the Digital Catapult Centre Brighton is to provide access to the 5G testbed.

Academic entry requirements *(below is the standard copy, please amend as appropriate)*

Applicants should have a minimum of a 2:1 undergraduate degree and desirably hold or expect to achieve excellent grades in a masters degree, in a relevant subject from a UK university or comparable qualifications from another recognised university.

English language entry requirements *(below is the standard copy, please amend as appropriate)*

Proof of meeting the UCL English language proficiency requirements where necessary. For SEAHA candidates, a standard level certificate is normally required. See <http://www.ucl.ac.uk/prospective-students/graduate/life/international>



Applicants whose first language is not English must have successfully completed a Secure English language Test (SELT) in the last two years. Applicants who have obtained or are studying for a UK degree may apply without a SELT. However, the university may request a SELT is taken as part of any award made.

English language IELTS requirements are minimum of 6.0 in each component.

If you have an English language qualification other than IELTS, please contact us to see if you are eligible to apply for a studentship. The UK Home Office will not accept TOEFL tests as proof of meeting the English language requirements

Eligibility criteria

See <http://www.seaha-cdt.ac.uk/study-with-us/studentships/eligibility-criteria/>

Funding

This project is a four year integrated MRes/PhD studentship in the SEAHA Centre for Doctoral Training (www.seaha-cdt.ac.uk), funded by the EPSRC, UCL, the University of Brighton, the University of Oxford, and SEAHA heritage and industrial partners. The project is fully funded for UK resident students, and fees-only for other EU students. Limited possibility of funding for international students may also be available.

Contact

If you have any questions about this project, funding or application process, please contact:

Dr Frauke Behrendt, email: F.Behrendt@brighton.ac.uk

Dr Maria Papadomanolaki, email: m.e.papadomanolaki@brighton.ac.uk

How to apply

The application should be submitted by email direct the SEAHA inbox at the University of Brighton:

SEAHA@brighton.ac.uk

and not by the UCL or UoB online admissions system.

To submit an application by **Thursday 19th April**, please include all of the following:

- a substantial covering letter (2–3 pages) including a clear explanation of your motivation for your proposed project
- a statement of your understanding of your eligibility according to the information provided at: <http://www.seaha-cdt.ac.uk/study-with-us/studentships/eligibility-criteria/> and <https://www.epsrc.ac.uk/skills/students/help/eligibility/>
- a research proposal (approx. 2,000 words) including project research questions and methodology
- a full detailed CV
- contact details for two academic references (names, postal and email addresses)
- proof of meeting the UCL/UoB English language proficiency requirements where necessary.

We will only consider complete applications.



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