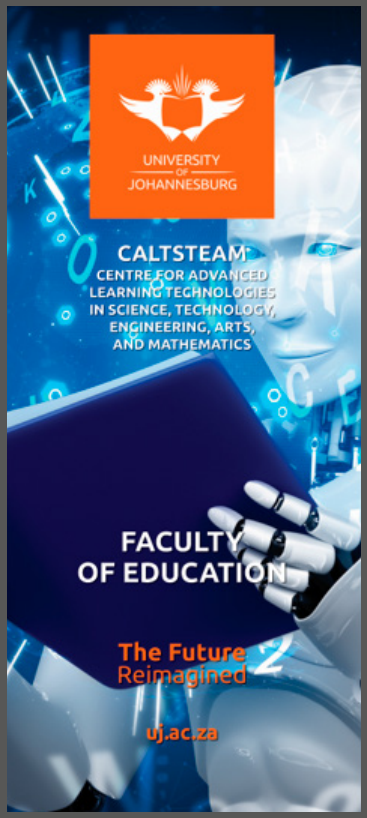
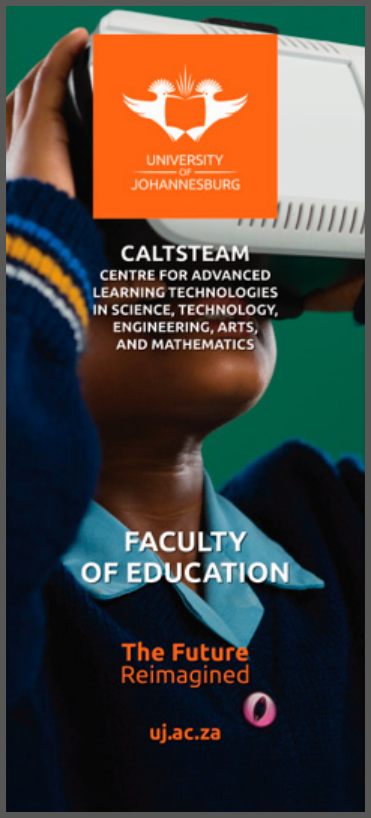

UNIVERSITY OF JOHANNESBURG
20 YEARS
2005-2025
Our Future. Reimagined.
CENTRE FOR ADVANCED LEARNING TECHNOLOGIES IN SCIENCE, TECHNOLOGY, ENGINEERING, ARTS AND MATHEMATICS (CALTSTEAM)
FACULTY OF EDUCATION

ABOUT CALTSTEAM

The Centre for Advanced Learning Technologies in Science, Technology, Engineering, Arts and Mathematics (CALTSTEAM) undertakes research in the application of advanced learning technologies, including virtual reality, augmented reality, artificial intelligence, and machine learning in the context of STEAM education. The Centre is an academic entity of the University of Johannesburg, associated with the Department of Mathematics, Science and Technology Education in the Faculty of Education.





VISION

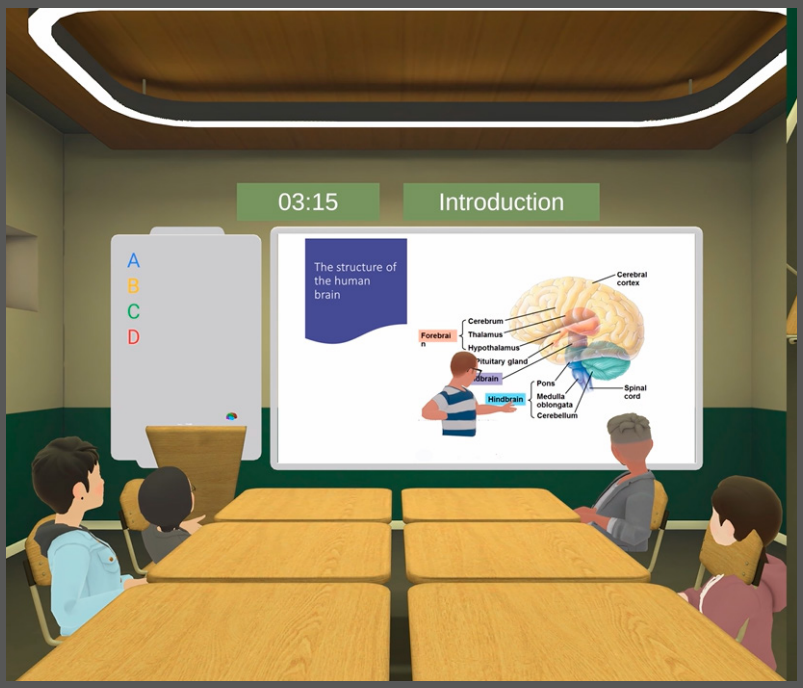
The major vision of CALTSTEAM is to improve access to high-quality education in STEAM by harnessing the affordances of advanced learning technologies (ALT). CALTSTEAM's approach is to build socio-economic and human capital development architecture through robust research, teaching, and skills development.

MISSION

- Advance scholarship through innovative, interdisciplinary research in technology-enhanced learning in STEAM education.
- Develop educational software applications (with potential for commercialisation) in advanced learning technologies such as virtual and augmented reality.
- Lead discussions and debates in academic, business, government, and civil society on the role of advanced learning technologies in STEAM education.
- Supervise students undertaking postgraduate studies in advanced learning and technologies in STEAM education and address and support employability within the correct industries or as government technocrats and practitioners.
- To create internship opportunities for university students to gain practical experience in the IT sector
- To offer courses and certifications on emerging technologies that can be tailored to meet the needs of the current and future workforce

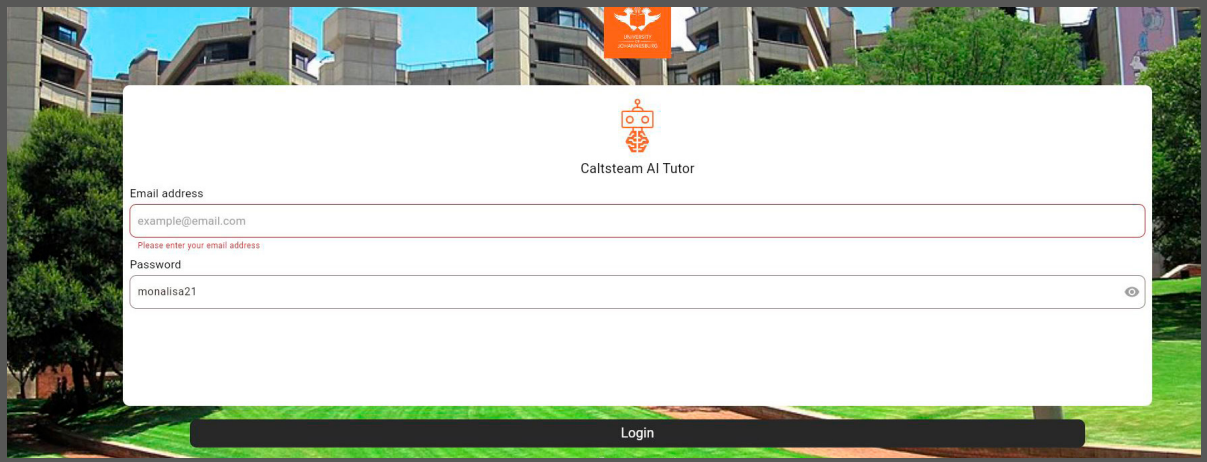
KEY PROJECTS AT THE CALTSTEAM

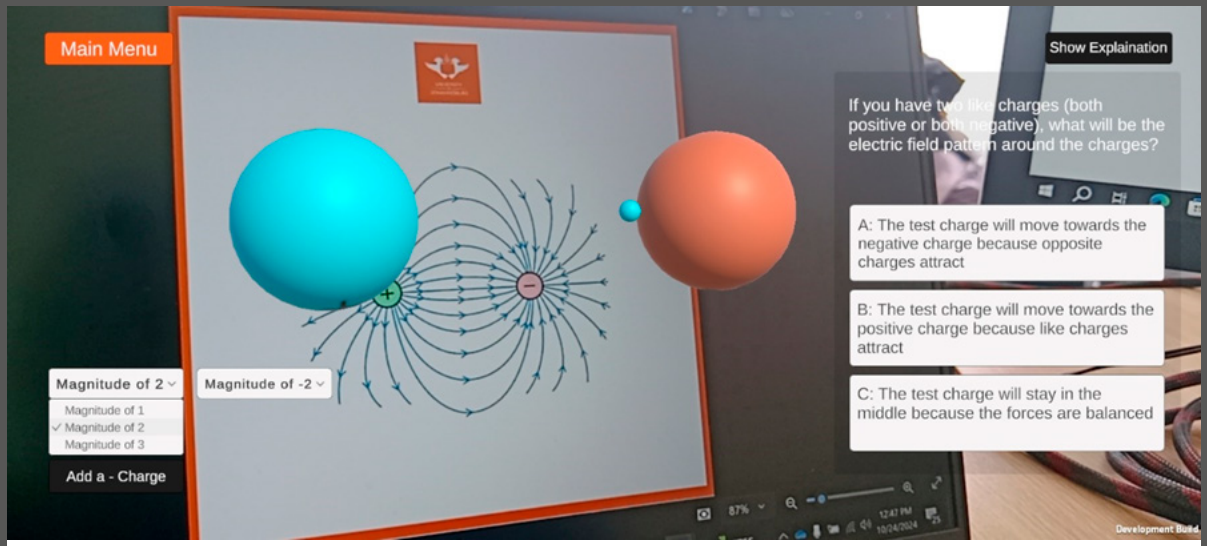
LAViR: In collaboration with the Swiss Distance University of Applied Sciences, CALTSTEAM is developing a virtual reality classroom for pre-service teacher education. This innovative project integrates Learning Analytics (LA) and Virtual Reality (VR) to create a realistic training environment, revolutionising teacher education.

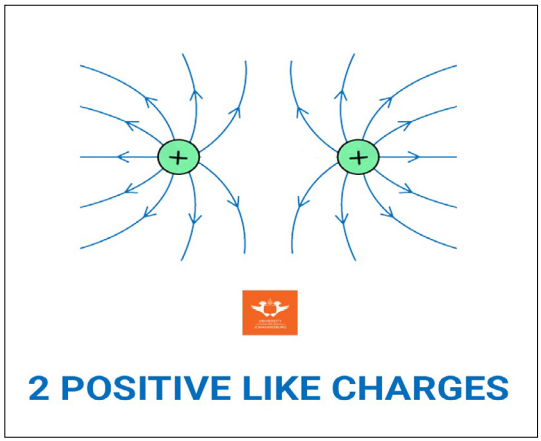


CAVARS: CALTSTEAM has developed Culturally Anchored Virtual and Augmented Reality Simulations (CAVARS). This project demonstrates the Centre's commitment to using technology for cultural preservation.

AI inquiry tutor: Leveraging the latest advancements in AI and machine learning, our AI Tutor is built to understand each student's unique learning path, provide personalised guidance, and foster a deep, inquiry-driven educational experience.







Electrostatics AR: This immersive and interactive augmented reality (AR) application developed by CALTSTEAM encapsulates the Predict, Observe, Explain (POE) cycle of inquiry when learning the physics of electrostatics and Coulomb's law.

VR-enhanced video annotation: This project, conducted in collaboration with the University of Hong Kong, investigates the pedagogical noticing of pre-service teachers in VR-enhanced video annotation.

COMMUNITY ENGAGEMENT

At CALTSTEAM, we are dedicated to empowering youth so that they may leverage 4IR technologies to transform their lives. Below are some of these initiatives:

XR Online Coding Club: The Club is open without cost to school learners and university students throughout the African continent. The purpose of the club is to empower youth in the development of XR applications and to create opportunities for them to work on XR projects.

STEAM Clubs: Through the establishment of Science, Technology, Engineering, Arts and Mathematics (STEAM) clubs at historically disadvantaged schools to promote project-based learning, learners at such schools acquire the 4Cs of 21st-century skills (Critical thinking, Creativity, Collaboration and Communication).

CALTSTEAM SURF

The Student Undergraduate Research Forum (SURF) at CALTSTEAM creates a robust research culture amongst undergraduate students through mentorship from researchers at the centre and opportunities for them to collaborate on research projects.

School Hackathon

In celebrating National Science Week, the Centre organises an annual STEAM Mobile Application Coding Hackathon. In the hackathon, teams of learners have the opportunity to unleash their creativity and expand their coding skills to build mobile applications in Science, Technology, Engineering, Arts and Mathematics (STEAM) that tackle real-world challenges!

STUDY AT CALTSTEAM

MPhil and DPhil

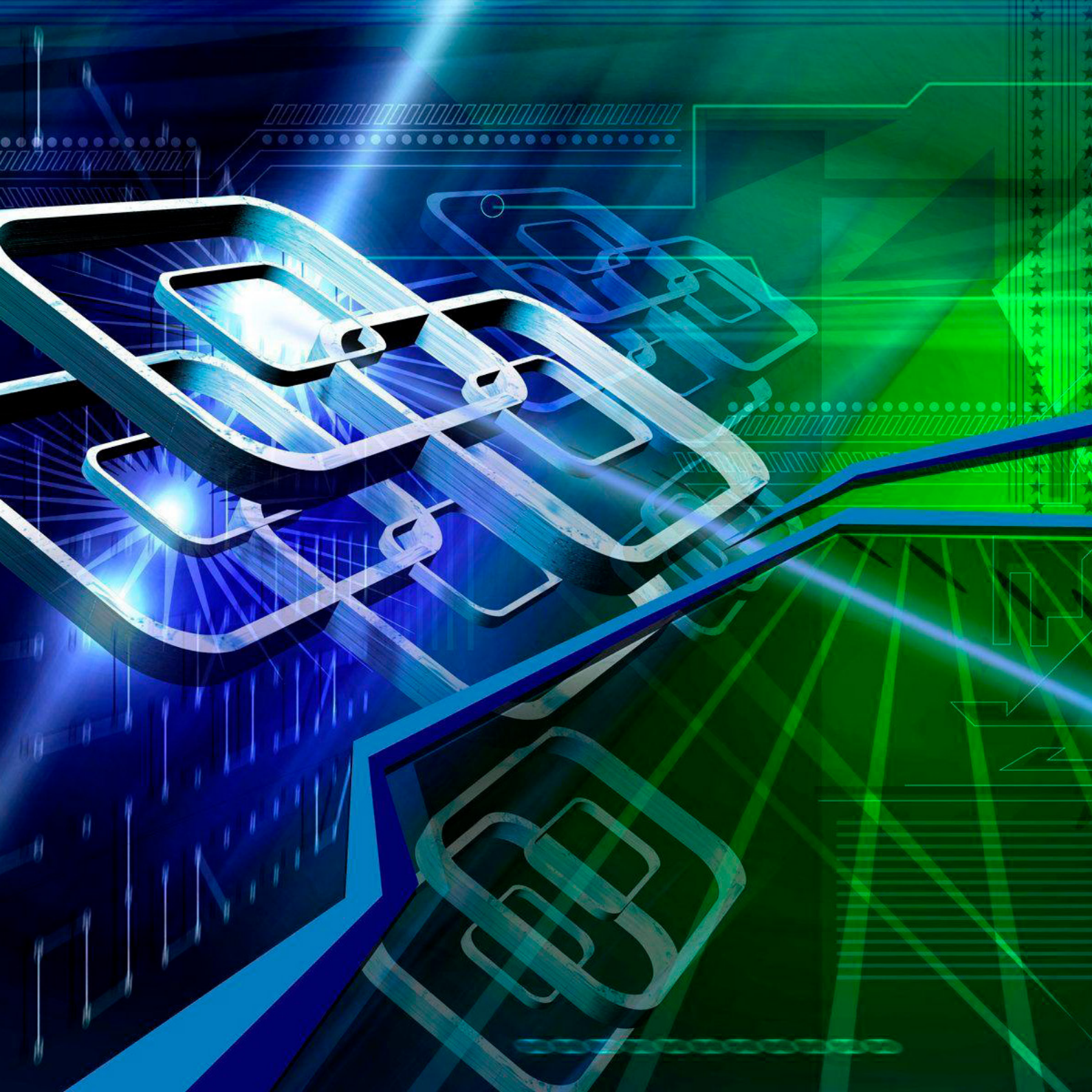
The MPhil and DPhil are two highly desirable specialist interdisciplinary qualifications in which students undertake independent research into the development, testing, teaching and learning efficacy of applications for virtual and augmented reality within STEM. Students may also do an MEd or a PhD in Science Education.

Click on or scan the QR code to see the MPhil programme details

Click on or scan the QR code to see the DPhil programme details

MPhil

DPhil



CONTINUOUS TEACHER EDUCATION

CALTSTEAM offers a Short Learning Programme (SLP) to qualified Life, Physical and Natural Sciences teachers on the use of virtual and augmented reality in science teaching. During the SLP, teachers learn about the affordances of VAR and how to use various VAR applications in their teaching of various science subjects. They also explore how to critically select VAR applications for integration in science lessons

CALTSTEAM MEDIA LINKS

Overview of the Centre's work:

Its inception hub VARSTEME in the Voice of America:

Podcast on YouTube:

Op-Ed titled "When digital tech meets ancient customs — harnessing technology to strengthen Africa's cultural heritage":

Podcast on Spotify:

Op-Ed titled "For young people facing a jobless future, technology-enhanced learning could be a game-changer" published in Daily Maverick":

Article in iTWeb:

Article in IOL:

Article in University of Johannesburg news:

CONTACT INFORMATION

Send an email to: caltsteam@uj.ac.za

Director of the CALTSTEAM, Prof Umesh Ramnarain: uramnarain@uj.ac.za

Centre and Office location: Auckland Park Kingsway Campus, Albert Wessels Building, B Ring 301