ACCELERATING RESEARCH WITH ADVANCED DIGITAL INFRASTRUCTURE

ADVANCED COMPUTING

OPEN SCIENCE

RESEARCH DATA

RESEARCH SOFTWARE

Technology-enabled research practices (eResearch) have become a game changer in the pace and depth of research discoveries in the 21st century. The University of Cape Town (UCT) has built a first-rate eResearch ecosystem, enabling African scholarship to contribute meaningfully to global knowledge. eResearch offerings encompass world-class systems and services for storage, transfer, analysis, preservation and dissemination of data, which are central to advancing inclusive, sustainable and globally impactful research.
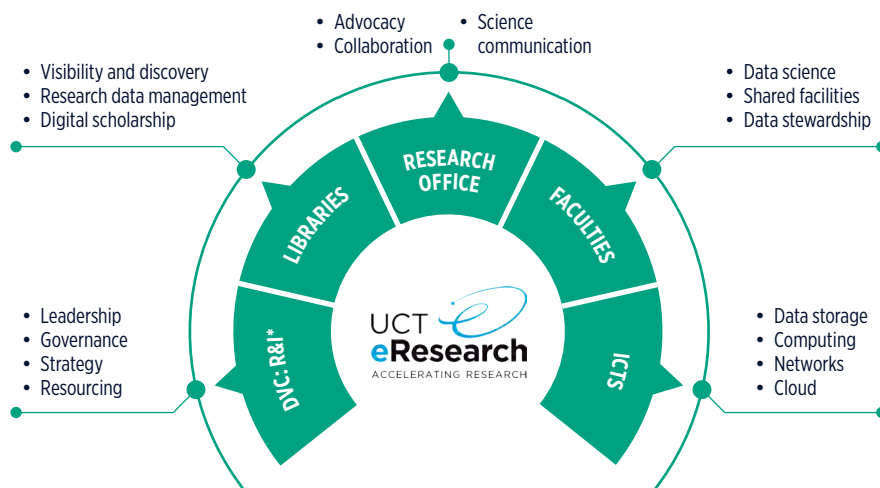
UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

UCT eResearch ecosystem

The eResearch Centre leverages cross-domain expertise and infrastructure with partners at the university Libraries, the Research Office, Information and Communications Technology and Services (ICTS) and the office of the Deputy-Vice Chancellor: Research and Internationalisation (DVC: R&I) to foster a collaborative ecosystem that supports data-intensive research and advanced computing.

- Advocacy
- Collaboration
- Science communication

- Visibility and discovery
- Research data management
- Digital scholarship

- Data science
- Shared facilities
- Data stewardship

RESEARCH OFFICE

LIBRARIES

FACULTIES

DVC: R&I*

ICTS

UCT eResearch
ACCELERATING RESEARCH

- Leadership
- Governance
- Strategy
- Resourcing

- Data storage
- Computing
- Networks
- Cloud

*Research and Internationalisation

Advanced computing

Specialised data-intensive support for research projects that generate or analyse vast amounts of data enables the university's researchers to engage in cutting-edge, data-driven science. This includes providing access to and guidance on using critical infrastructure, demonstrating a deliberate choice to build premier capabilities.

UCT HIGH PERFORMANCE COMPUTING (HPC) FACILITY

The **UCT HPC facility** is a powerful, reliable, scalable and economically viable computing resource for researchers tackling complex computations with massive datasets. It supports general computational science, simulations and modelling across diverse disciplines. Housed within ICTS data centres, the HPC cluster leverages existing sophisticated support infrastructure, ensuring operational stability and efficiency.

ILIFU

Ilifu supports data-intensive research in astronomy and bioinformatics. Hosted at UCT and operated by the Inter-University Institute for Data Intensive Astronomy (IDIA), the collaborative initiative is funded by a consortium of South African universities and the Department of Science, Technology and Innovation (DSTI). Ilifu unifies separate cloud systems into a single resource and develops cloud-based solutions for strategic national research projects. It enables African researchers to lead and participate in major international data-intensive scientific initiatives, including the Square Kilometre Array (SKA), the MeerKAT radio telescope and large-scale genomics projects like Human Heredity and Health in Africa (H3Africa).

Open science

UCT is committed to ethical, collaborative research supported by strong governance and open science principles. Our digital and data infrastructure, guided by expert committees and eResearch, supports integrity and compliance. UCT endorses the United Nations Educational, Scientific and Cultural Organisation (UNESCO) Recommendations on Open Science and the Declaration on Research Assessment (DORA) principles, promoting fair research assessment and transparency. We strive to make research "as open as possible; as restricted as necessary", ensuring innovation, reproducibility and global impact. We are members of the ORCID, Crossref and DataCite organisations and use ORCID iDs and digital object identifiers (DOIs) throughout our systems to make all our research outputs, including publications, data and software, compliant with the FAIR (Findable, Accessible, Interoperable, and Reusable) principles.

Research data

As Africa's leading university, UCT provides a trusted, end-to-end research data environment. The university's certified infrastructure and expert services ensure that the breadth of research collaborations uphold the highest standards of data integrity, security and accessibility.

UCT's leadership in Research Data Management

UCT DATA MANAGEMENT PLANNING (DMP) TOOL

The UCT **DMP tool** helps researchers navigate funder requirements and comply with good research data management practice by providing structured questions related to the research data lifecycle and offering helpful tips in developing comprehensive data management plans.

ZIVAHUB OPEN DATA UCT

ZivaHub is UCT's Institutional Data Repository and primary platform for the publication and open access of research data and other scholarly outputs. It facilitates the creation of FAIR data, a critical standard for contemporary research. ZivaHub is CoreTrustSeal-certified, validating the repository's adherence to international practices for long-term data accessibility, reliability and integrity.

DIGITAL SCHOLAR SERIES

The **Digital Scholar Series** ensures UCT's research community can fully leverage the available data infrastructure. Through curated workshops on digital practices, tools and platforms, researchers and postgraduates across all disciplines build data management and digital literacy skills, ensuring the university's investment in infrastructure is matched by the expertise required to harness its potential.

Tailored research data services and support

GEOGRAPHIC INFORMATION SYSTEMS (GIS) CONSULTING

GIS Consulting provides expert geospatial analysis, cartographic design and platform-agnostic support that enables spatial reasoning and mapping across diverse research fields.

IBALI DIGITAL COLLECTIONS UCT

The university publishes a collection of unique cultural and heritage data in a structured and interactive way through **Ibali**. The platform is powered by Omeka S, an international open source web-publishing software for digital collections. Over 60 sites host more than 80 000 items, ranging from recordings of theatrical performances and landscape photography to resources on indigenous languages and community history.

EMANDULO

Emandulo, an open access digital archive developed by the Five Hundred Year Archive (FHYA) in UCT's Department of Historical Studies, assembles scattered multimedia resources from all over southern Africa and across the world. At its heart is a growing collection of early African language resources. Bringing these diverse materials together for the first time, in a searchable online format, allows the innovative application of novel and experimental research techniques.
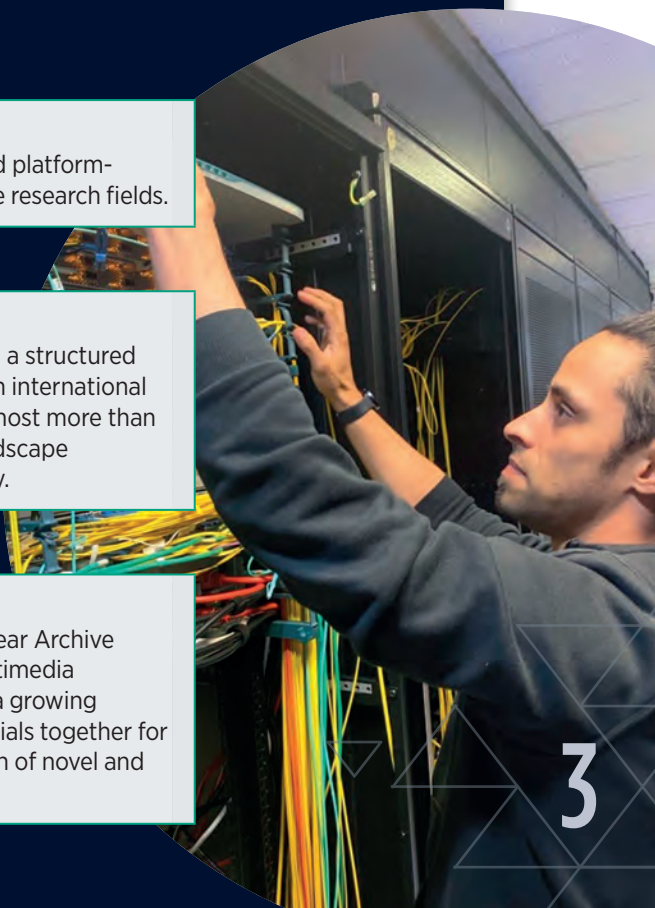
Research software

In modern research, breakthrough science is often powered by custom-built software. Research Software Engineering (RSE) has become central to modern research enabling advanced analyses, simulations and innovation across disciplines. Applying best practices in research software development is essential for reproducible and trustworthy science.

Research software for discovery

IDIA VISUALISATION LABORATORY (VISLAB)

Based in the Department of Astronomy, the **Inter-University Institute for Data Intensive Astronomy (IDIA) Vislab** is a hub for innovation in scientific visualisation. Created to support the global research community in pushing the boundaries of data exploration, the lab designs and tests advanced hardware and software solutions for interactive visualisation of massive astronomical and multidisciplinary datasets.

DATA VISUALISATION INTERACTIVE EXPLORER (iDaVIE)

iDaVIE allows scientists to step directly inside their data. With the tool, multi-dimensional datasets can be explored and interrogated in an entirely new way, including navigating vast astronomical data cubes, probing cosmological simulations, or examining MRI and CT scans for breakthroughs in health, biology and engineering.

CUBE ANALYSIS AND RENDERING TOOL FOR ASTRONOMY (CARTA)

CARTA is designed for fast, scalable image visualisation and analysis. Optimised for Square Kilometre Array (SKA) pathfinders and beyond, CARTA is transforming how researchers handle the flood of data produced by modern observatories.

COMPUTATIONAL BIOLOGY (CBIO) DIVISION

Based in the Department of Integrative Biomedical Sciences, **CBIO** is the centre of bioinformatics activities at UCT. The CBIO division previously led a National Institutes of Health-funded Pan African bioinformatics network for Human Heredity and Health in Africa (H3Africa), H3ABioNet. The network developed bioinformatics capacity across the continent and now leads the eLwazi open data science platform. CBIO employs software engineers and bioinformaticians that develop African data resources and bioinformatics tools.

Research software for innovation

ELEMENTAL NUMERICS

The Industrial Computational Fluid Dynamics (InCFD) Research Group works closely with the university's spin-off company **Elemental Numerics** to develop state-of-the-art CFD modelling software that is a strategic technology for design due to its enabling fast simulation and digital prototyping. This symbiotic public-private partnership uses applied mathematics and computational modelling to support international leaders in the aerospace industry, Airbus, in their aircraft design.

SCIENTIFIC COMPUTING RESEARCH UNIT (SCRU)

The **SCRU** is future-proofing research with laboratories that combine innovative computational design alongside the development of experimental methods that produce in vitro models and data. SCRU's glycobiomedical lab and advanced computing resources produce cutting-edge technologies. Novel therapeutic candidates for cancer and respiratory conditions have emerged, and a cancer diagnostic is undergoing clinical trials.

- **5** candidate drugs in development
- **5** software packages produced
- **2** patents for disease therapeutics and diagnostics
- **62** trained translation scientists
- **R12 million** invested in cancer and therapeutic research to date