From Lab to Cloud: How Queensland University of Technology (QUT) Transforms Research Through Scalable Infrastructure

Professor Michael Milford

Director, QUT Centre for Robotics

Dr Andrew Janke

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Enabling Robotics and AI Research and Development in the Modern Age

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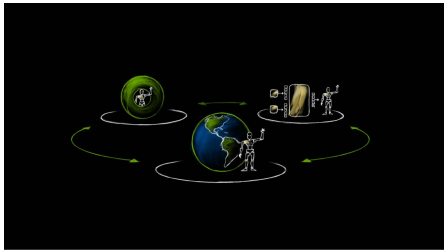
https://www.youtube.com/milfordrobotics
http://www.tinyurl.com/milfordm
https://goo.gl/rczsle

QUT Centre for Robotics

Overview

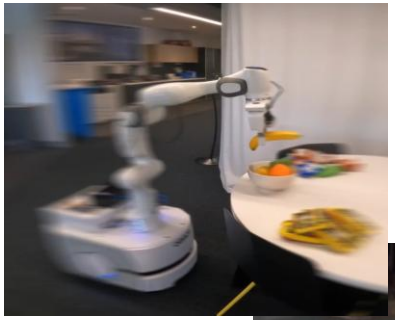
1) The Research Revolution

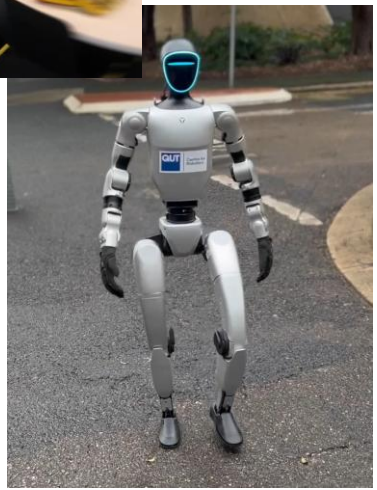


2) Compute and AI-enabled Robotics Research and Impact

Resource Infographics: NVIDIA NVIDIA Warp

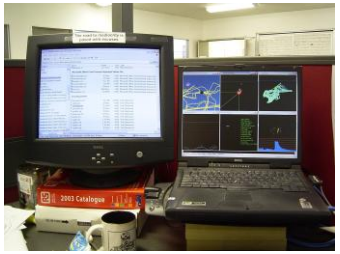
3) Looking to an Exciting Future

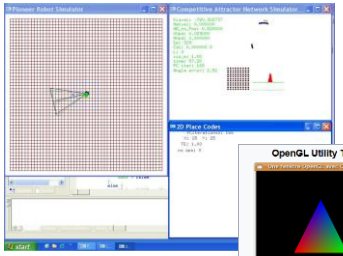


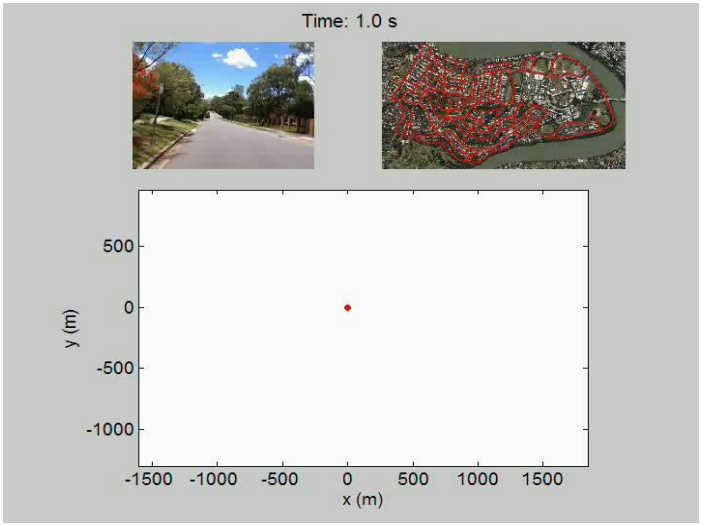


Refer to the **paper references** and **researcher / organization credits** throughout

A Personal Perspective: The Research Compute Ecosystem Revolution





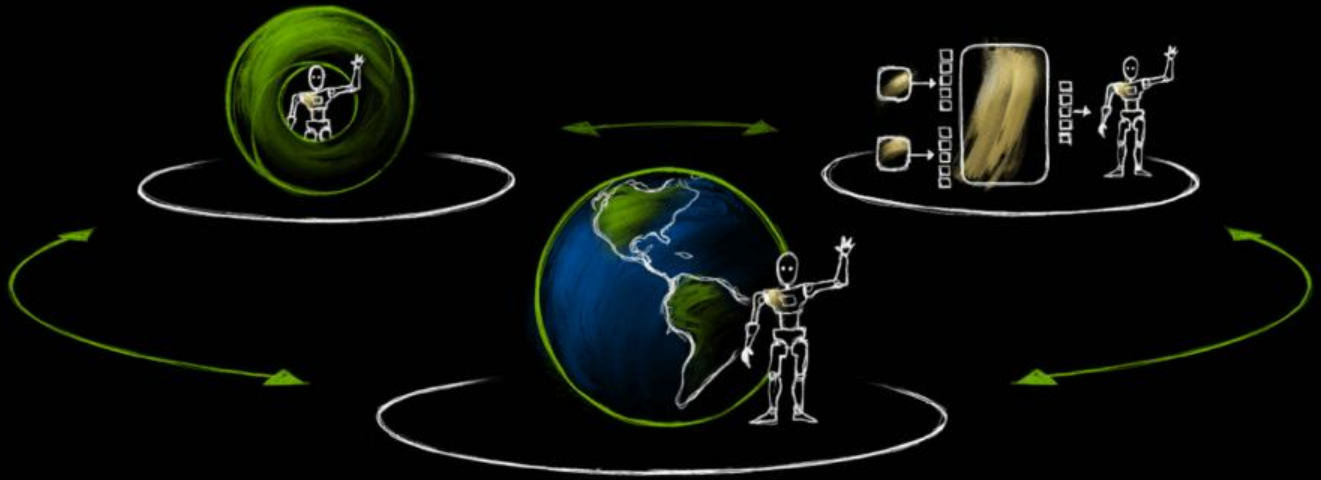


PAPER HIGHLIGHTS

MJ Milford, GF Wyeth, "Persistent navigation and mapping using a biologically inspired SLAM system", *The International Journal of Robotics Research* 29 (9), 2010.

MJ Milford, GF Wyeth, "Mapping a suburb with a single camera using a biologically inspired SLAM system", *IEEE Transactions on Robotics* 24(5), 2008.

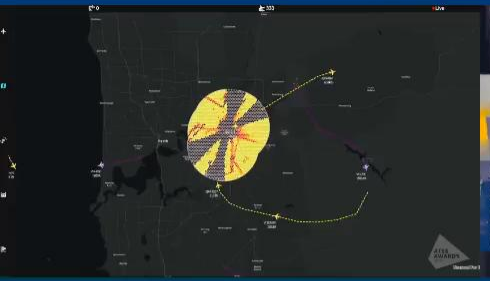
Enter… Modern Research Compute Support Ecosystems



(1) NVIDIA DGX AI supercomputers for AI training
(2) NVIDIA Omniverse and Cosmos on NVIDIA RTX PRO Servers for simulation
(3) NVIDIA Jetson AGX Thor for on-robot inference.

Fundamental and Applied Research on Robots and Autonomous Platforms

Aerospace | Environment | Manufacturing | Defence | Agriculture | Mining | Medical | Infrastructure | Logistics



Air

Land

Water

Major Centres and Projects

QUT Centre for Robotics

Australian Cobotics Centre

Australian Robotic Inspection and Asset Management Hub

Joint Biomechanics Training Centre

SAEF Securing Antarctica's Environmental Future

ARM Advanced Robotics for Manufacturing HUB

Australia-US International Multidisciplinary University Research Initiative (AUSMURI)

Australian Government Australian Research Council Laureate Fellowship

2014-20 Headquarters of the Australian Centre for Robotic Vision

Education, Outreach and Expert Advising

Fellows of Learned Academies and Bodies

Australian Academy of Science

IEEE

Board Roles

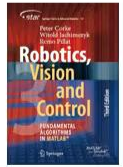
Australian Government Civil Aviation Safety Authority

ATSE Australian Academy of Technology & Engineering

MTA Institute

Bachelor of Engineering (Honours) (Mechatronics)

Master of Robotics and Artificial Intelligence



ROBOT ACADEMY

Math Thrills

Antarctica

Joe Mastroianni, National Science Foundation

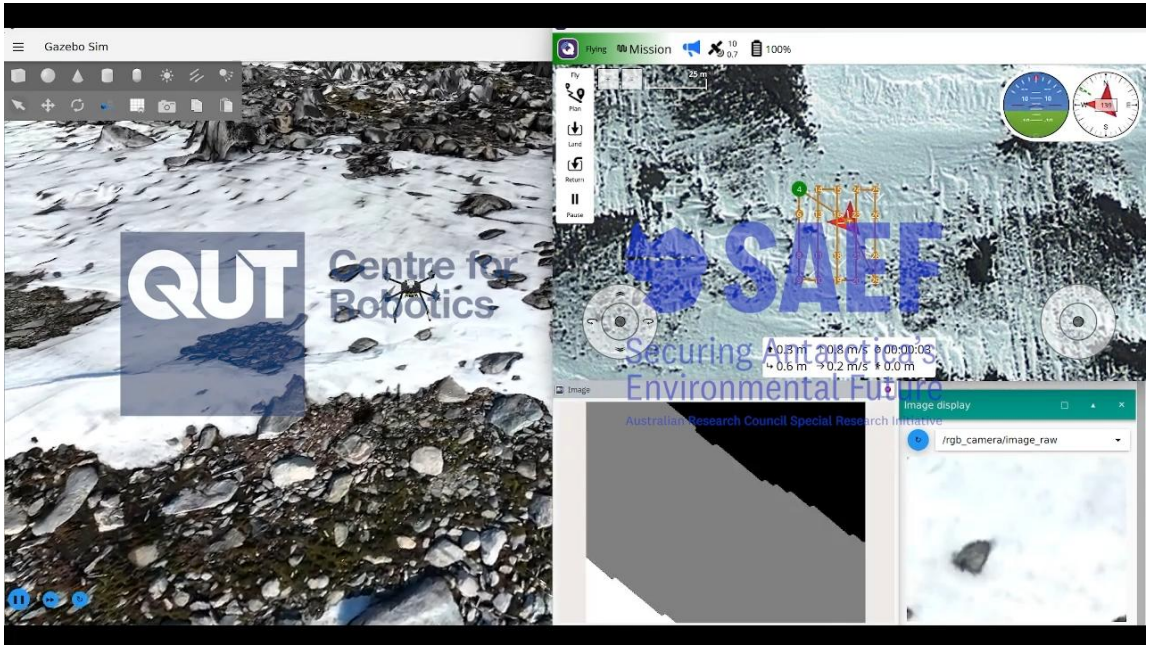
UAV Simulation and Decision-making In Antarctica

CIs: Professor Felipe Gonzalez, Professor Barbara Bollard. Researchers including Juan Sandino.

- **Real-Time Detection:** minimizing time spent on site assessments.

- **Efficiency and Environmental Impact:** reduces the need for extensive ground truthing, allowing for accurate mapping with minimal environmental disturbance.

- **Broad Applicability:** This approach is scalable and can be applied to other remote and challenging environments, offering a valuable tool for global ecological monitoring.



NVIDIA NVIDIA RTX Pro 6000 and the Jetson Orin Developer Kit

Achievements: Poster Presentation at NVIDIA GTC 2025, NVIDIA Academic Grant, Paper on Scientific Reports, Nature Portfolio

QUT Centre for Robotics
4,147 followers
3mo •

Congratulations to QUT Centre for Robotics research fellow Dr Juan Sandino who has received an NVIDIA Academic Grant Program Award! Dr Sandino's project is researching AI and drones for real-time vegetation discovery in Antarctica. The grant awards the team cutting-edge hardware from NVIDIA to boost their research with Securing Antarctica's Environmental Future (SAEF). Thank you to NVIDIA for supporting this vital research!

To find out more about SAEF and why the environmental future of Antarctica matters to us all – see here: https://arcsaef.com/

@NVIDIAAIDev

#NVIDIAGrant #Antarctica #QUT #Engineering #Robotics #Drones

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nature › scientific reports › articles › article

Article | Open access | Published: 26 July 2025

Drone hyperspectral imaging and artificial intelligence for monitoring moss and lichen in Antarctica

Juan Sandino, Johan Barthelemy, Ashray Doshi, Krystal Randall, Sharon A. Robinson, Barbara Bollard & Felipe Gonzalez

Scientific Reports **15**, Article number: 27244 (2025) | Cite this article

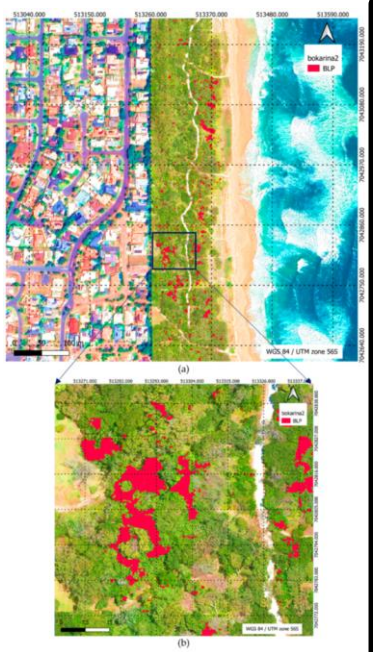
4517 Accesses | **23** Altmetric | Metrics


The Beach
OCR

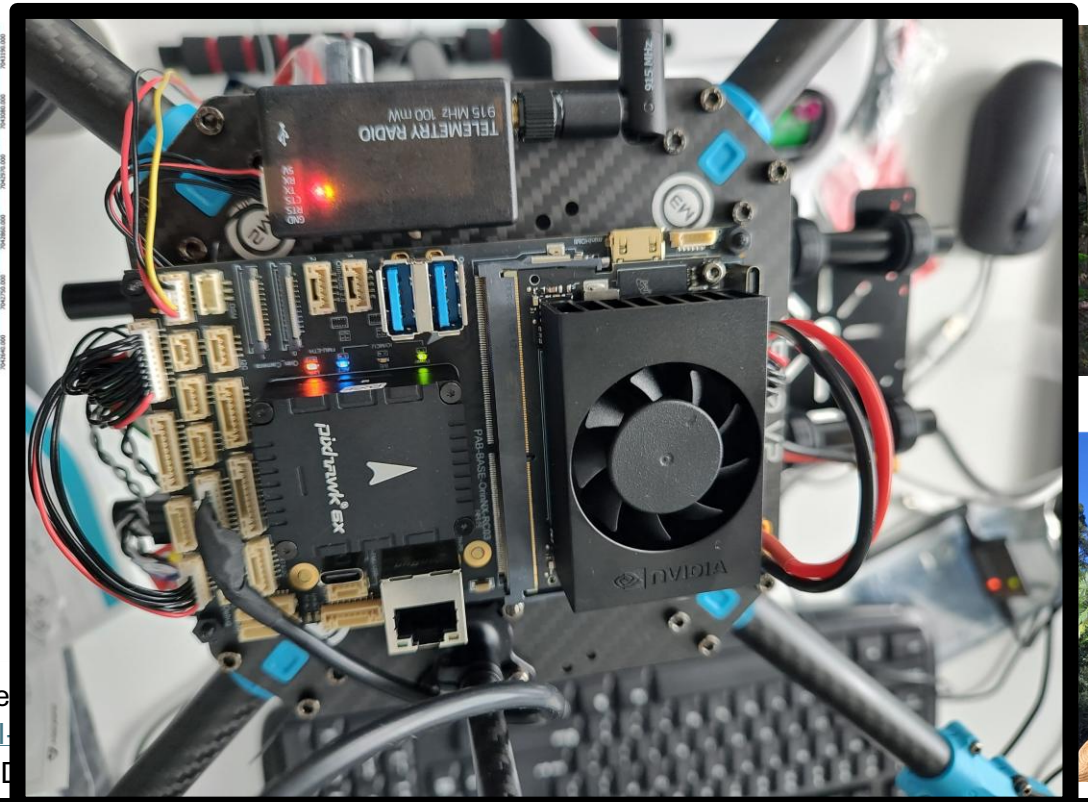
Using drones and AI to map invasive plant species

NVIDIA Jetson Orin Nano

CIs: Dr Fernando Gonzalez, Sunshine Coast Council and Aspect UAV Imaging, Queensland Government



Map of Broad-leaved peepe
predicted presence from AI-
model Sunshine Coast, QLD



Boiteau, S., Vanegas, F., Galvez-Serna, J., & Gonzalez, F. (2025). *Model-Based RL Decision-Making for UAVs Operating in GNSS-Denied, Degraded Visibility Conditions with Limited Sensor Capabilities*. Drones, 9(6), 410. https://doi.org/10.3390/drones9060410

The Reef

Wiki: Author: Holobionics: https://en.wikipedia.org/wiki/File:Moore_Reef_underwater_ReefScape.jpg



CIs: Scarlett Raine, Benjamin Moshirian and Tobias Fischer

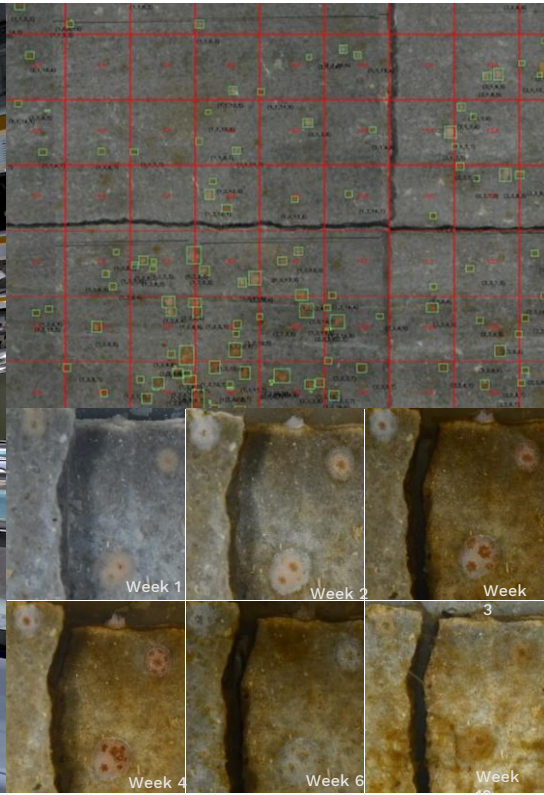
REEF RESTORATION & ADAPTATION PROGRAM

Australian Government | Australian Institute of Marine Science

Reef Guidance System

Coral Growout Robotic Assessment System (CGRAS)

Dorian Tsai and many colleagues and collaborating organisations



The Moon

https://www.elo2.au/

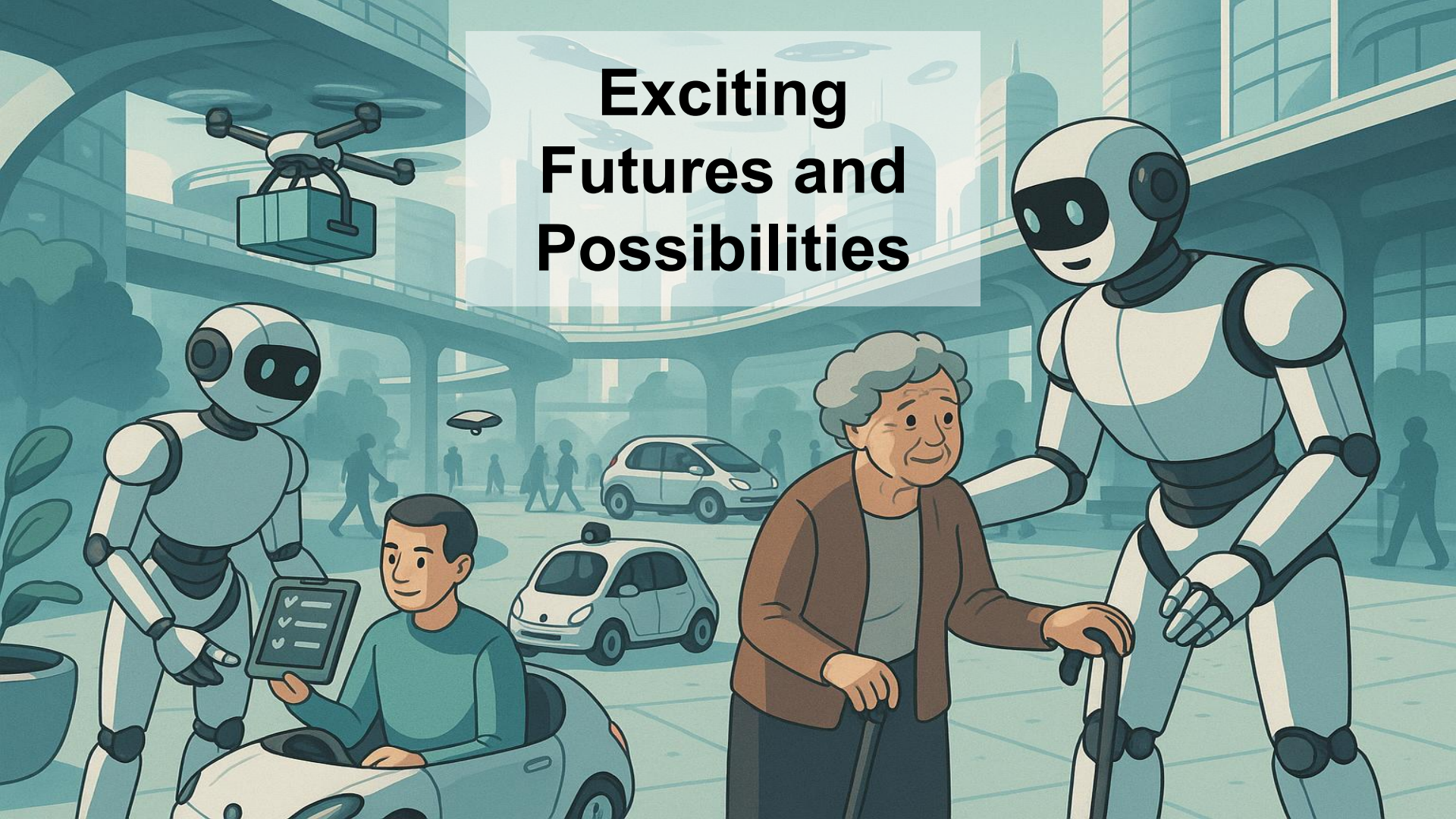
Yandiwanba Lunar Space Testing Facility at QUT

IAC Signing Ceremony

Left to right: Professor Niko Suenderhauf, Dr Dimity Miller, Associate Professor Thierry Peynot, Associate Professor David Flannery and Professor Michael Milford.

QUT Investigator Team

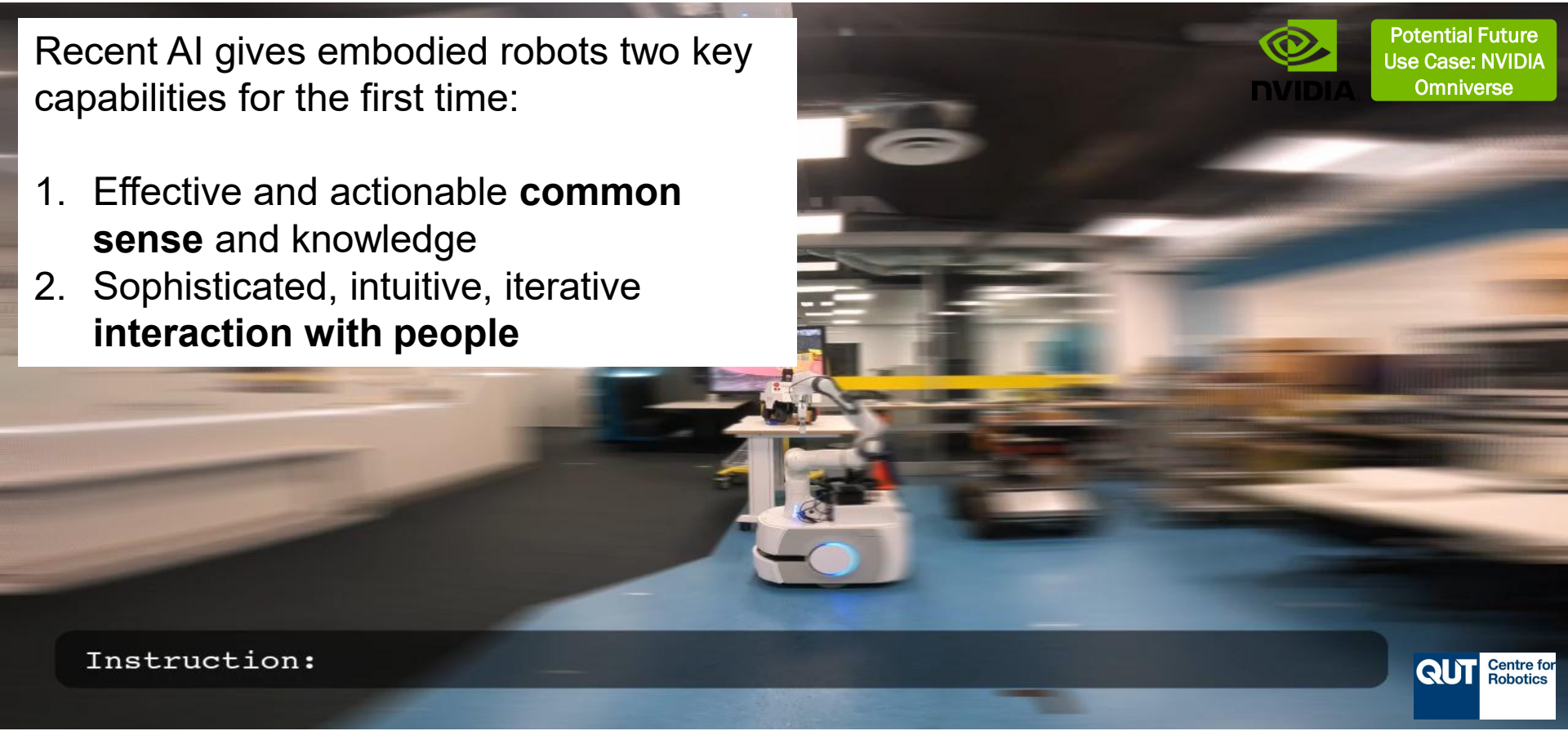
Exciting Futures and Possibilities



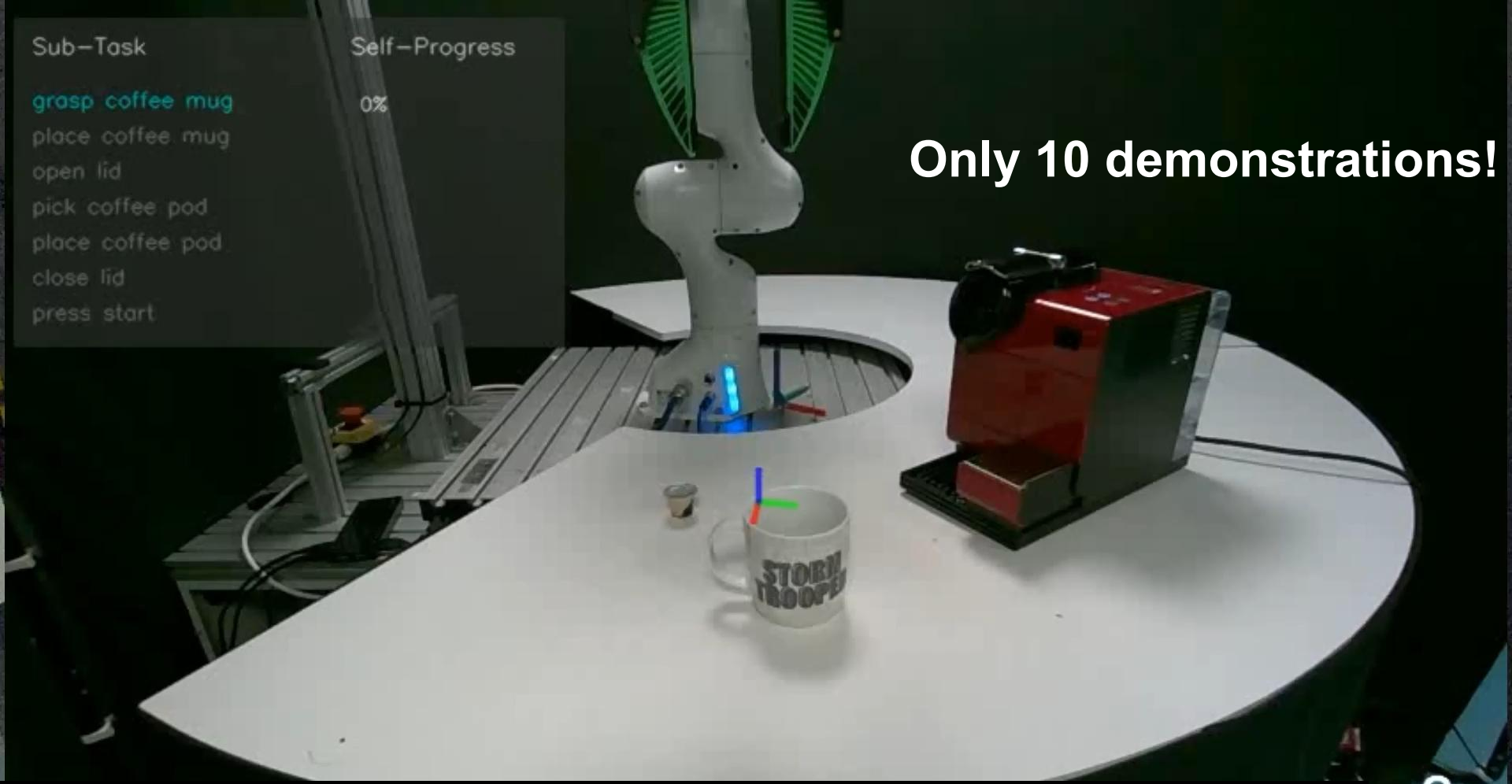
Entering the Physical World: Large Language Models and Robotics

Recent AI gives embodied robots two key capabilities for the first time:

1. Effective and actionable **common sense** and knowledge
2. Sophisticated, intuitive, iterative **interaction with people**

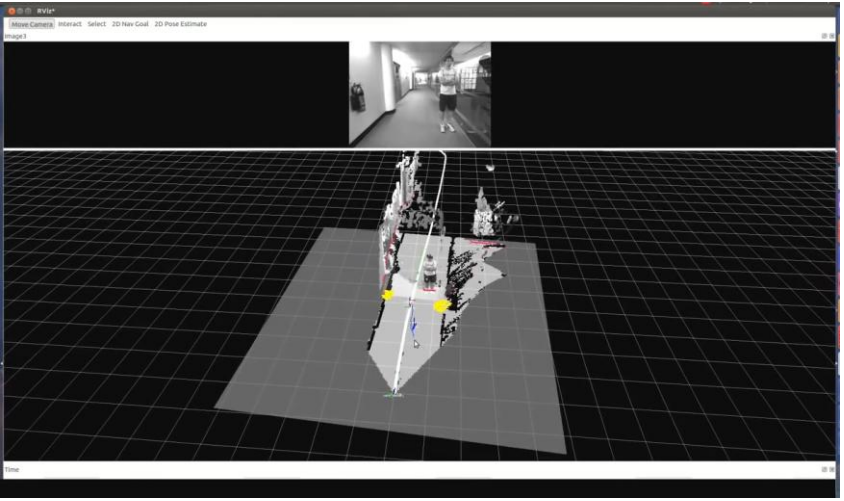


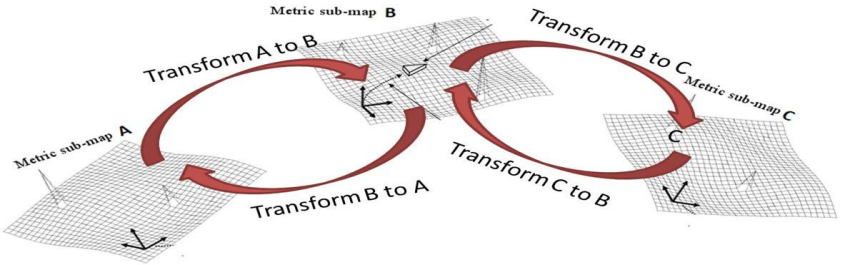
Rana, K., Haviland, J., Garg, S., Abou-Chakra, J., Reid, I.D., & Sünderhauf, N., "SayPlan: Grounding Large Language Models using 3D Scene Graphs for Scalable Task Planning.", in *Conference on Robot Learning*, 2023



Learning from 10 Demos: Generalisable and Sample-Efficient Policy Learning with Oriented Affordance Frames
Krishan Rana, Jad Abou-Chakra, Sourav Garg, Robert Lee, Ian Reid, Niko Suenderhauf. Conference on Robot Learning (CoRL) 2025.

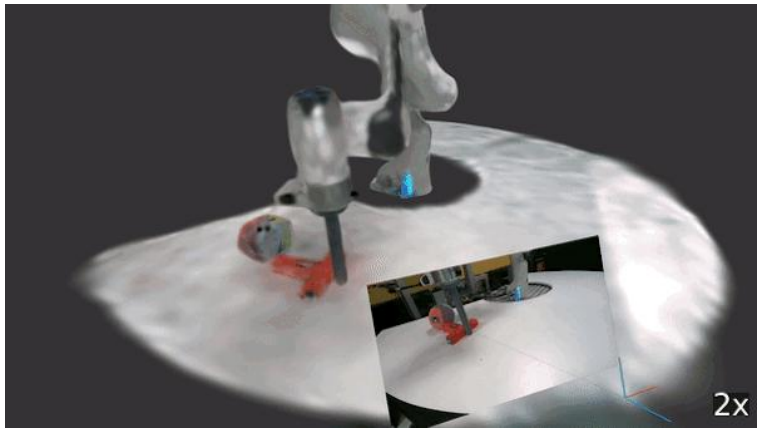
How Robots (and Nature) Spatially Encodes the World





Building Robotic Mental Models with NVIDIA Warp and Gaussian Splatting

NVIDIA Warp



A dual representation: particles and Gaussians

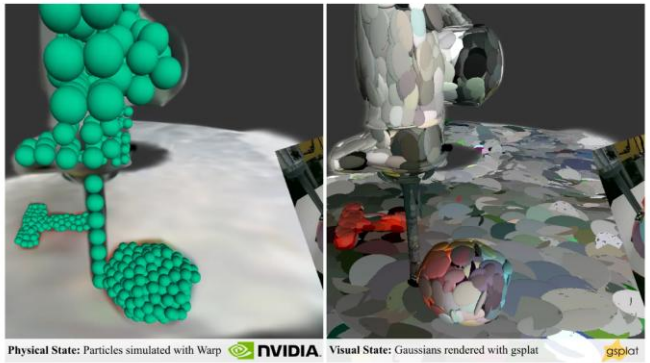


Figure 1. The dual representation of embodied Gaussians showing the particles that are acted upon by the physics system (left) and the Gaussians rendered with Gaussian splatting (right)

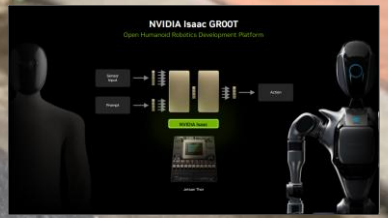
Niko Sünderhauf

Jad Abou-Chakra

SYDEKICK ROBOTICS

https://developer.nvidia.com/blog/building-robotic-mental-models-with-nvidia-warp-and-gaussian-splatting/

Footage courtesy Prof Jonathan Roberts and colleagues.
Interested in joining a bid for a national centre in humanoids?
E-mail jonathan.roberts@qut.edu.au or attend our October 30th Humanoids in the Real World: Transforming Work, Life, and Innovation event.



NVIDIA

Potential Future Use Case: NVIDIA Isaac GR00T

Enabling Robotics and AI Research and Development in the Modern Age

Thanks for Listening: We're Always Happy to Chat

Professor Michael Milford, FTSE
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https://www.youtube.com/milfordrobotics
http://www.tinyurl.com/milfordm
https://goo.gl/rczsle

QUT Centre for Robotics

Research Enablement Strategy

DR ANDREW JANKE

AD Digital Research Infrastructure
Research Portfolio | Academic Division

AD Enterprise Technology
Digital Business Solutions | Administrative Division

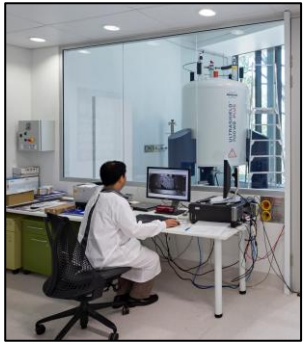
WHY ONE SIZE DOESN'T FIT ALL

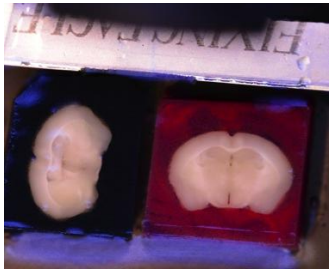
When RI just worked,
I got more things done that needed a PhD

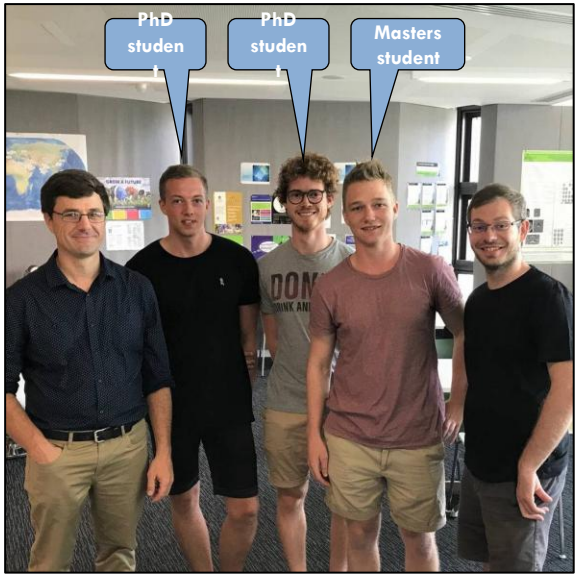
Research Data strategy is key
everything else follows

DRI is what an academic needs
it's not always complex

Relationships get things done
particularly in complex organisations







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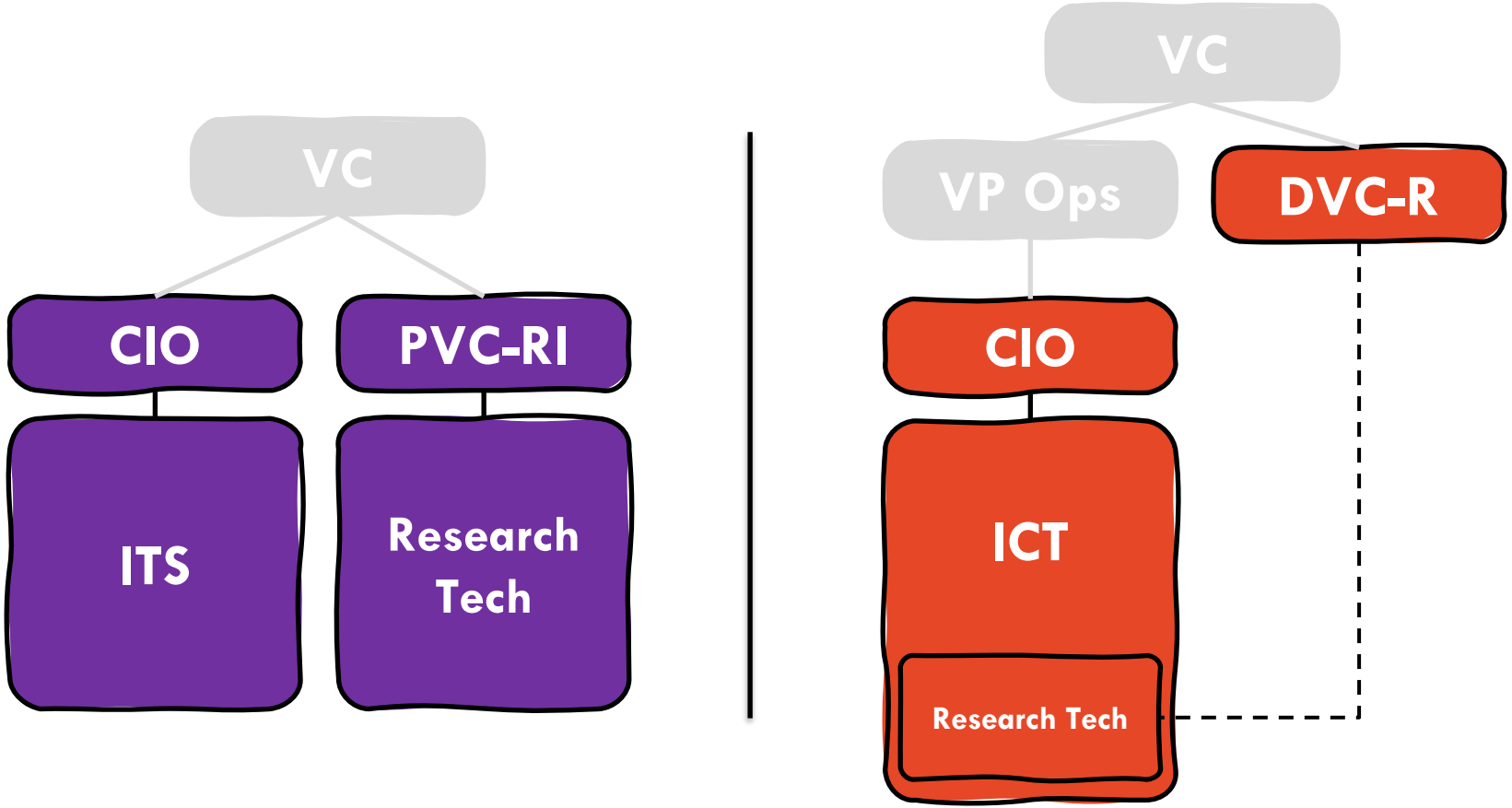
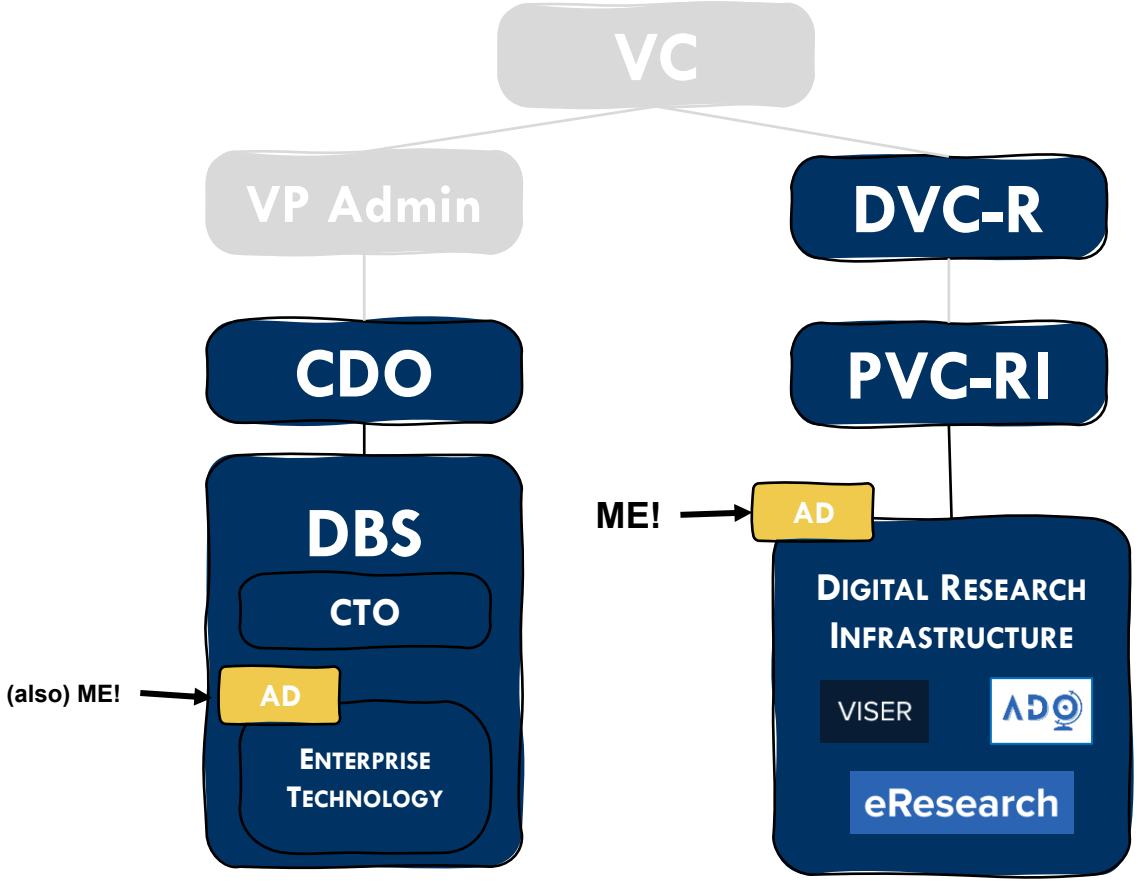

VC
CIO
PVC-RI
ITS
Research Tech
VC
VP Ops
DVC-R
CIO
ICT
Research Tech

QUT the university for the real world



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All Research (now) involves IT

so, either get in or get out of the way...

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and increasingly involves

Why is this important?

- Not only the “fat head” of users – **all the users**
- All the hard cases, **clinical, adjunct, associate, industry, community**
- No backing away **“not in my remit”**
- Research **isn’t just QUT**

- SLA’s
- Security
- Architecture review board
- CAB

aarnet
Australia's Academic and Research Network

eduroam

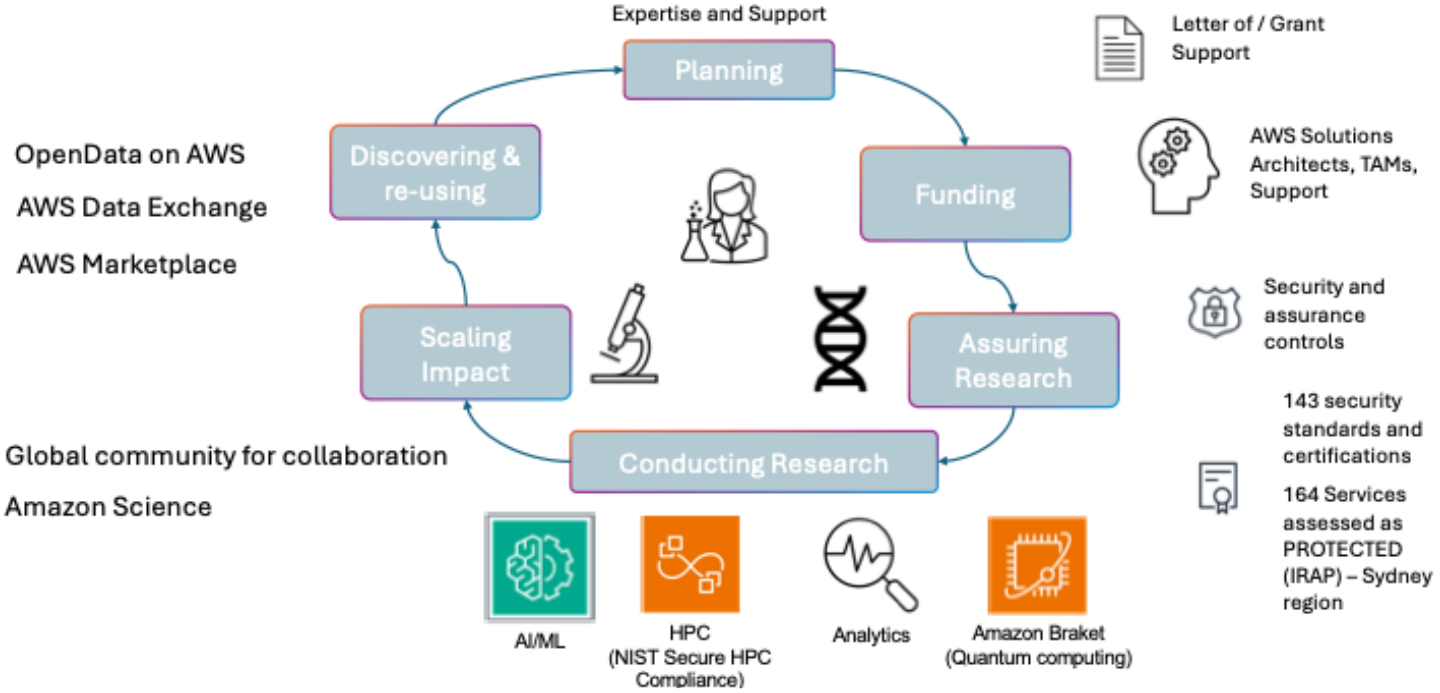
ORCID
Connecting Research and Researchers

eduGAIN

AUSTRALIAN ACCESS FEDERATION

TEQSA Provider ID PRV12079 Australian University | CRICOS No. 00213J

AWS accelerates each stage of the research journey



TEQSA Provider ID PRV12079 Australian University | CRICOS No. 00213J

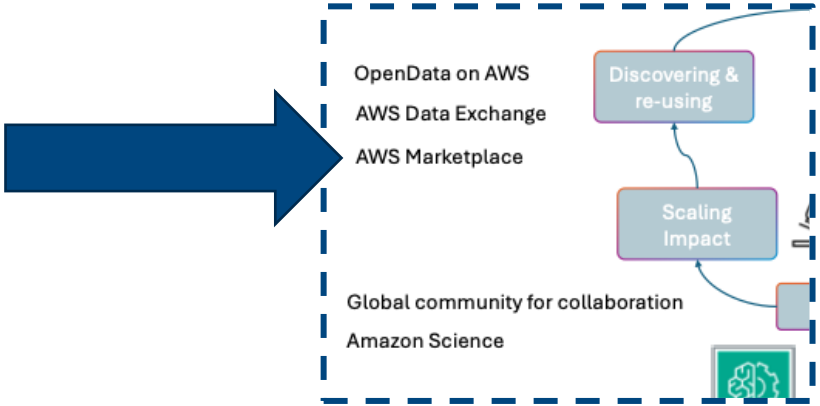
Dr Jake Bradford

Dr Jake Bradford

jake.bradford

Postdoctoral Research Fellow

Dr Jake Bradford is a Postdoctoral Research Fellow in the School of Computer Science at the Queensland University of Technology (QUT). Jake completed his PhD in 2022 at QUT, where he researched improving the safety and efficiency of CRISPR-based gene editing. His research focuses are in the fields of bioinformatics, computer science and data science.



I want to sell a thing

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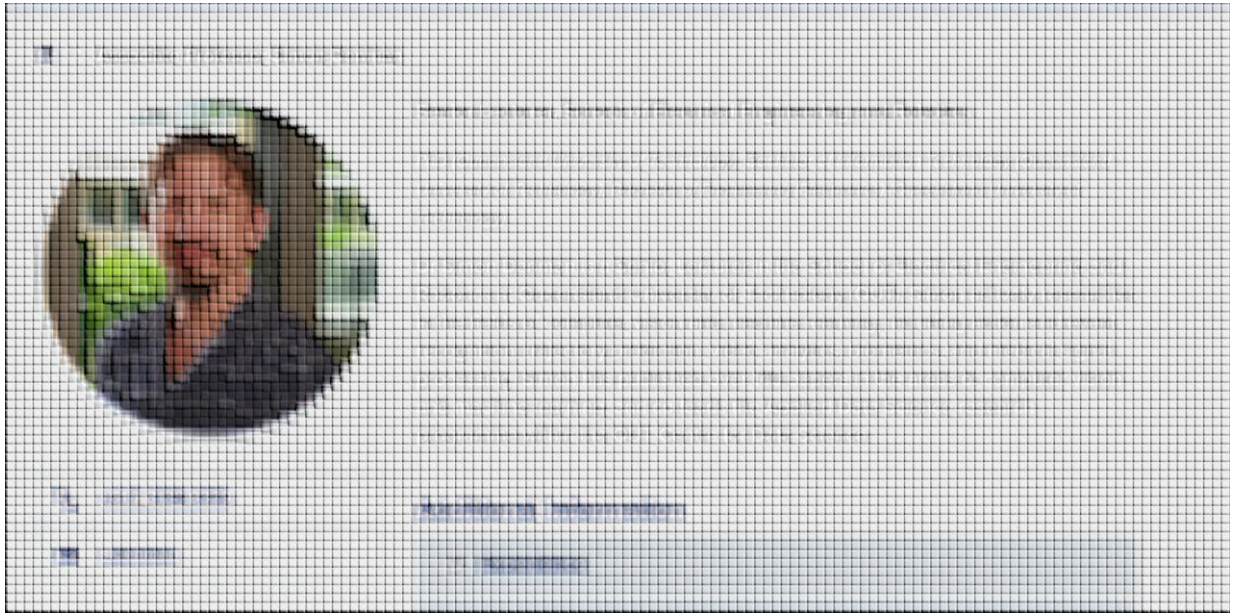

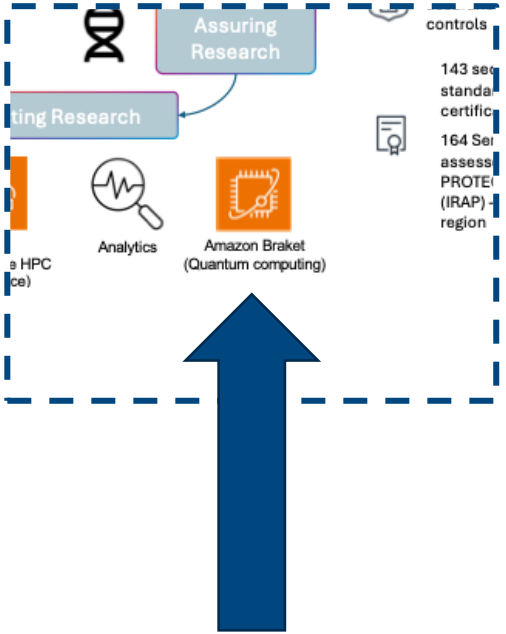

...exploring how we can use quantum computing to .... and ....- and ***we're keen to have access to some actual quantum hardware to help with this***

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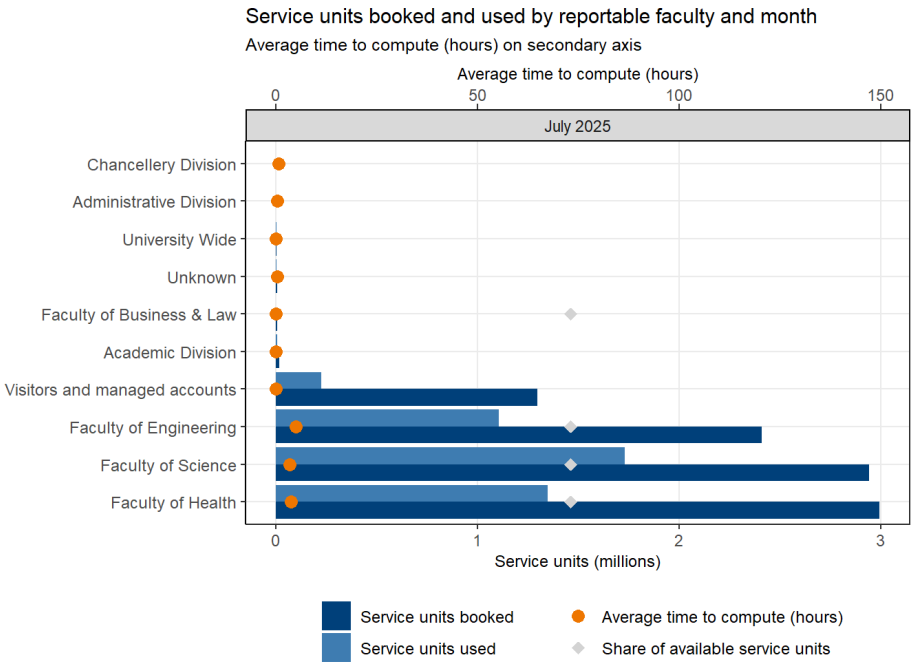
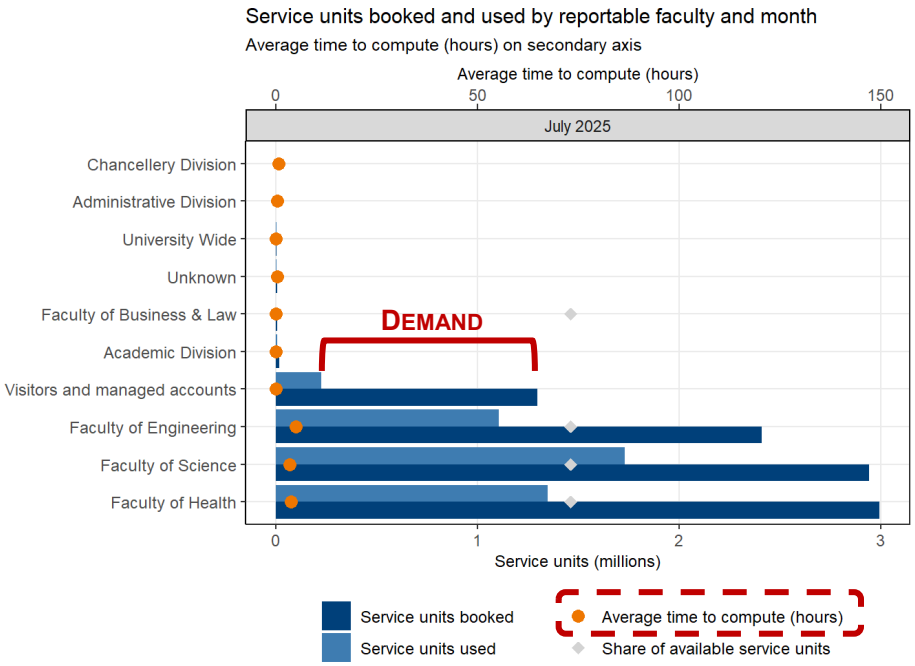
AWS HPC first



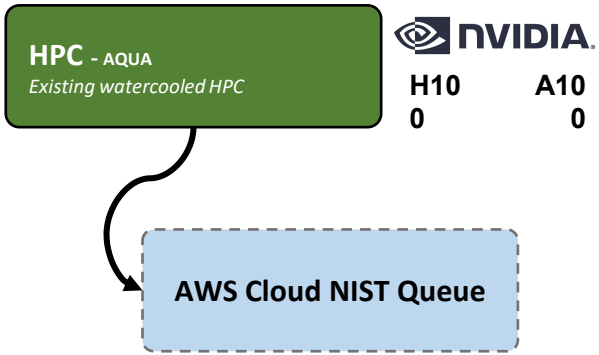
TEQSA Provider ID PRV12079 Australian University | CRICOS No. 00213J

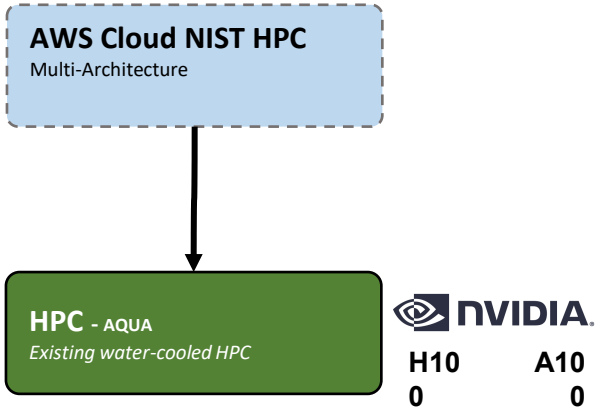
AWS HPC first

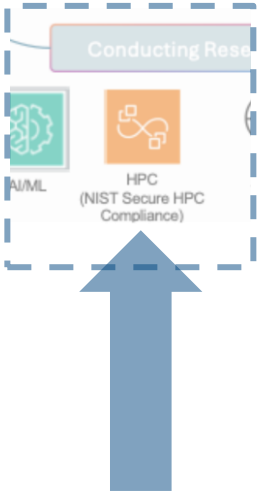


TEQSA Provider ID PRV12079 Australian University | CRICOS No. 00213J

AWS HPC first







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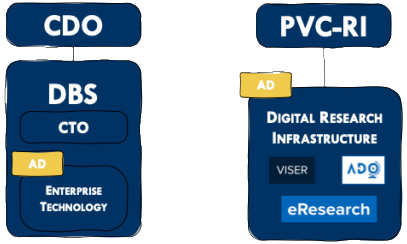

STRUCTURE IS IMPORTANT

IT'S ABOUT YOUR ACADEMICS

AWS Solutions Architects, TAMs, Support

IT'S ABOUT YOUR PARTNERS

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Thank you!

Questions?