

THE ULTIMATE NETWORKER

A conversation with **KUMUDU MUNASINGHE**, Associate Professor in Network Engineering at the University of Canberra (UC), located in the Australian Capital Territory.



The university is number 34 in the 2019 Times Higher Education (THE) Young University Rankings. Overall, in the 2020 THE, UC has risen 69 positions to 193rd, securing its place in the top one per cent of universities globally. UC's Faculty of Science and Technology was formed in January 2018, with a particular remit to link scientific research, and translate this into tangible impact. Associate Professor Munasinghe leads the Internet of Things (IoT) Research Group at the university's Human-Centred Technology Research Centre.

Can you explain the synergy between science and technology?

I moved into IoT research about six years ago and my colleagues started saying: 'hey, you are great at connecting things and building networks. You're running real-time data storage on the cloud. You play with various kinds of sensors. How about you collaborate with us?' So now my research on IoT sensor networks enables them to collect and upload data in the cloud. This means that UC researchers, and academics anywhere in the world, can access data stored through multiple interfaces. We're also working on projects with industry and the community.

How do the scientists analyze all this data?

Another service we provide is real-time data analytics. We run algorithms to analyze data, extract what our colleagues need and collaborate to get the best possible snapshot of their data by building an end-to-end platform.

Can you discuss some of your successful collaborations?

We have a project with the National Arboretum Canberra located over 220 hectares. The arboretum has 104 forests with 44,000 trees from more than 100 countries, where each

species has very different water requirements. We've developed an IoT-based soil moisture monitoring system to feed into their irrigation system. It takes readings of the volumetric water content of the soil at a number of intervals and uploads them to the cloud. Arborists, managers, and even members of the public, can log on and see how much water a particular forest needs. Since 2016, we've gone through two stages of this project. We're at Phase 3, eventually rolling it right out across the arboretum. This is an ideal scenario for research with impact: it's about sustainability, saving water resources, and working with communities.

How have you used this technology to work with animals?

The Frog-Phone is a project with ACT FrogWatch, one of Australia's biggest citizen science projects. People go out to these frog ponds and keep monitoring frogs to do a census. Frogs are rapidly declining globally and are a good indicator of climate change. One challenge for FrogWatch is getting enough people to go out to frog ponds, especially at night when the frogs are most active making their breeding calls. So, we created a phone that people can place at a remote pond at any time and then go

home. They dial the frog phone at the optimum time and listen and record the frog calls from the convenience of their sitting room. We're now working on the second iteration of the project.

How is UC using IoT for environmental monitoring?

About 20 minutes drive from Canberra is the town of Queanbeyan with a population of about 36,000 people. My colleagues and I got together with UC's urban and regional planning experts and the Queanbeyan-Palerang Regional Council. We submitted a proposal to the government under the Smart Cities and Suburbs programme and received just under \$AU 1 million, to bring some smart technologies to the city. Under this grant, we've deployed sensors to monitor the cleanliness and pollutants of the Queanbeyan river. We're monitoring the particulate matter, CO₂, and noise levels on the main highway through the town and past several primary schools. Also, we've deployed an IoT-based volumetric water content measuring system for monitoring suburban treescapes, parks and playgrounds. This programme was launched in May 2019 and anyone can log on to the website and see real-time data.

Can you describe how you're involved with industry?

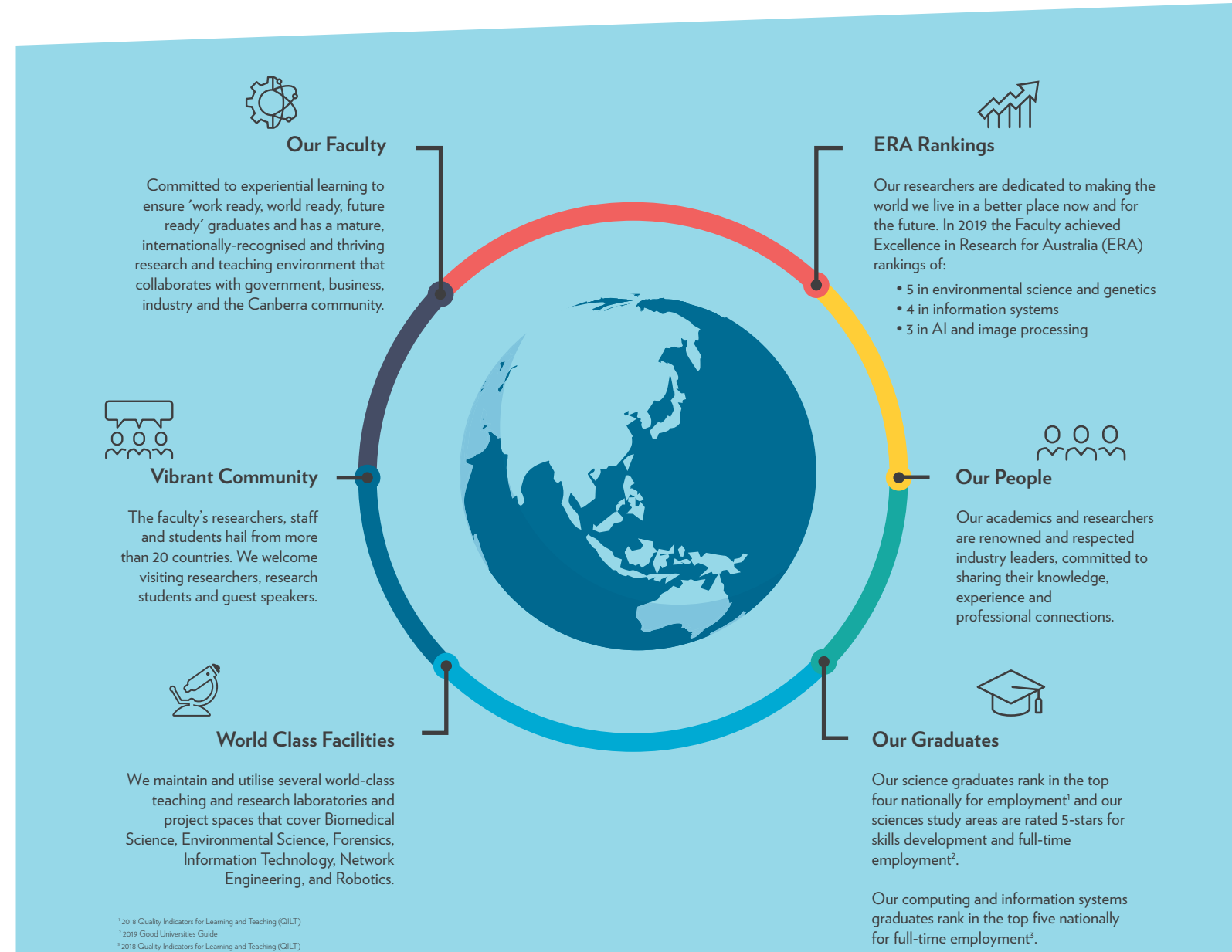
We're doing a project with Veolia Environmental Services, a multinational water, waste and energy management company. They run the Woodlawn Bioreactor at Tarago on the site of a disused, open-cut lead, copper and zinc mine. The bioreactor processes about 20 per cent of Sydney's putrescible waste, that which contains organic matter decomposable by microorganisms. Some gases such as methane, sulphur dioxide, hydrogen sulphide and CO₂ continuously escape from the landfill sites because it's a very high wind area. These gases drift into neighbouring properties and townships and the Environmental Protection Agency has received complaints. So, we're using our IoT sensory networks to monitor these escaping gases in real-time. We're also able to advise how landfill methane can be tapped, captured, and used as a fairly clean energy source for generating electricity or heat, rather than leaking into the air or being dispersed as waste.



DESIGNING THE FUTURE

The Faculty of Science and Technology at the University of Canberra encompasses two schools, the School of Information Technology and Systems and the School of Science.

Focusing on multidisciplinary research the faculty delivers solutions that make a real impact in society, from helping our ecosystems to therapeutic solutions, to understanding and developing the technology we use daily.



¹ 2018 Quality Indicators for Learning and Teaching (QILT)
² 2019 Good Universities Guide
³ 2018 Quality Indicators for Learning and Teaching (QILT)