UTS UNIVERSITY OF TECHNOLOGY SYDNEY

Cyber Security, Information Warfare & RF Warfare

WORKING WITH DEFENCE

About UTS

The University of Technology Sydney (UTS) is one of Australia's leading universities, delivering research solutions and new technologies to the Defence and Aerospace industries. Our researchers work closely with Australia's Defence Science and Technology Group (DSTG), Australian Defence Force, Office of National Intelligence, U.S. Department of Defense, international Primes and local small-to-medium enterprises. We're proud to host the NSW Defence Innovation Network and co-host the NSW Space Research Network.

Cyber Security

In April 2023, the Australian Competition and Consumer Commission reported that Australians lost a record $3.1bn to scams in 2022, up from $2bn lost in 2021. Much of the $3.1bn, could be traced directly to one of the almost 900 'notifiable data breaches' Australian organisations reported to the Australian Information Commissioner in that same period. Development of Australian sovereign capability in cyber security is fundamental to the Australian economy and protection of its assets. At UTS we are building unique facilities to support the training of the next generation of cyber security professionals with over 1,400 undergrad and postgraduate students per year enrolled in cyber security related subjects.

The rise in cyber security attacks on Australian assets will require innovative ways of securing and protecting assets. As a highly ranked university (top 3 in Australia and top 20 internationally) in AI, machine learning and telecommunications, UTS is leading a wide variety of cyber security research activities with high profile industry partners, such as NTT, Bosch, IBM, Spirent, Food Agility CRC, Nokia, Threat Defence, Secure Stack and Long Street Advisors, to strengthen cyber security and data privacy across Australia's agriculture, IoT, Industry 4.0 and telecommunications industries.

UTS has built unique facilities to enable cyber security research and teaching that spans the full stack of modern connected devices:

- **The RF and Communications Technologies Lab (RFCT)** provides R&D and forensic capability to analyse susceptibility of current and future technology to exploit.
- **DX Squared** is a UTS and NTT initiative for a shared digital transformation space with a mission to accelerate, establish and enhance cyber security collaborations in Sydney and grow a joint market for new R&D technology. UTS and NTT jointly conduct proof of concepts for cryptography information-sharing platforms utilising NTT's ABE (Attribute Based Encryption) technology. Dedicated research demonstrators and experiences are being developed to test and raise awareness of cyber security issues in a connected and digitised world.
- **The UTS Vault** is a purpose-built, 900 sqm Department of Defence compliant facility that is unique to NSW, enabling collaboration between private sector tenants and our researchers to advance research and commercialisation in world-leading cyber security and defence technology. The UTS Vault was funded by the NSW Government and is a key part of the Tech Central precinct. The UTS Vault aims to strengthen Australia's cyber security and defence capability and reduce national sovereign risk by building a pipeline of skilled workers for the cyber security, technology and innovation industries in Australia. The UTS Vault hosts a world leading Cyber Security Operations Centre (CSoC) operated by Threat Defence providing students and researchers with hands-on real-time cyber security training and operational capability.

Information Warfare

Disinformation, when weaponised, poses threats to civic society and national security by eroding trust in authorities and social cohesion. We specialise in developing and deploying dashboards to monitor discussions on social media and traditional media channels, particularly those targeted by adversaries in influence operations (IO). We lead in modelling online information flow, connecting it to real-world events. UTS's integrated research program addresses information operations across four stages: monitoring discussion spaces, detecting IO operatives and their narratives, predicting IO operation effectiveness, and crafting/testing countermeasures. We create theoretical models to understand disinformation flow within the human environment and develop real-time detection methods, packaging research into deployable software tools and dashboards.

UTS is a member of Defence Science Technology Group's (DSTG) Information Warfare Innovation Community to support the ongoing development, implementation, and quality assurance of DSTG's Information Warfare STaR Shot research and innovation initiatives. UTS excels in modelling human behaviour in online environments, analysing online communication's spread of mis- and dis-information, detecting adversarial campaigns, measuring IO effectiveness, and developing counter mis- and dis-information systems.

We are working to predict the effectiveness of state-sponsored influence operations, focusing on national security and the safety of online information and opinions. We are creating tools to detect harmful online content and implementing proactive mitigation strategies. This work is funded by grants from the Department of Home Affairs, DSTG and NSW Defence Innovation Network. Our team is designing methods and tools for monitoring social and traditional media to detect mis- and dis-information, foreign interference and state backed propaganda using the reaction of social systems as early warning systems.

Our models facilitate understanding content attention and predicting total engagement. We have connected online information flow with influence, identifying user ideology based on subconscious writing patterns, even during moderated language. We have also pioneered an approach to detect information operation agents based on social system reactions, effectively identifying Russian IO operatives and their narratives in a DSTG-sponsored project.

RF Warfare

The antenna and RF frontend play a critical role in various electronic warfare operations, including Electronic Surveillance (ES), Electronic Attack (EA), Electronic Protection (EP) and Signal Intelligence (SIGINT). Our team possesses extensive wideband antenna systems experience and knowledge in the design and prototyping of wideband antenna systems. These systems are invaluable for ES and SIGINT operations that require wideband functionality.

We excel in the construction of thin Electronically Steerable Antenna (ESA) systems and mechanical beam steering solutions. These antennas can be tailored to Defence bands (X, Ku, Ka, or mm-wave), and can be conformal to specific shapes. They find utility in EP applications by enabling beam redirection during attacks and in ES for radar operations. For applications demanding rapid beam switching, we are nearing completion of a test/demonstration platform showcasing electronic beam steering and radar capabilities. Our proficiency extends to software-defined radio and antenna integration, offering comprehensive solutions. Additionally, for power-constrained applications not requiring swift beam steering, we employ a non-electronic steerable thin (low-profile) flat-panel antenna technology, supported by DSTG for wideband Defence applications.

We have devised an innovative in-antenna power combining technique optimised for efficiently radiating high-power beams using solid-state RF technologies. Tested in mm-wave applications, this technique is well-suited for EA applications, including active denial systems and high-power mm-wave radars.

Our expertise extends to metasurfaces featuring absorptive frequency-selective transmission or receiving properties. These metasurfaces complement beam steering antenna systems, allowing the design of low-RCS (Radar Cross Section) antenna systems capable of scanning large areas discreetly. They are instrumental in ES applications for minimising RCS in various platforms and are equally suitable for EP purposes, serving as electronic shielding surfaces for vehicles or manpacks. Our portfolio includes fully metallic metasurfaces and flat-panel antennas with exceptional high-power handling capabilities, surpassing dielectric counterparts. Their low-profile design makes them versatile in space-constrained scenarios, proving invaluable in EA applications that demand beam steering and high-power handling.

Contact us

For more information on our Defence and Space capabilities visit: **uts.edu.au/defence-space**

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