



Capability Statement

Addressing cyber security challenges

The University of Wollongong (UOW) has been a leader in cyber security and cryptology for almost 30 years. With an international reputation for the quality of our research and education, the University plays an important role in developing advanced solutions to expand cyber capabilities across NSW and Australia, and in fostering skills of the cyber security workforce.

Australia is one of the world's most hacked countries. Malicious cyber criminals are exploiting the COVID-19 pandemic, with the Australian Cyber Security Centre (ACSC) having received over 67,500 cybercrime reports – or one every eight minutes - in the 2020-21 financial year.

Approximately a quarter of reported cyber security incidents in Australia have affected critical infrastructure organisations, including essential services such as education, communications, electricity, water, and transport. Data compiled by the Centre for Strategic and International Studies reveals Australian mining companies, defence contractors and government agencies are popular targets for hackers.

Australian organisations reported 1,051 data breaches in 2020. Data is everywhere, and continues to increase as we introduce IoT (internet of things) devices into our infrastructure. Cyber-related attacks – threatening individuals, businesses, governments and national security - are adversely affecting Australian jobs and the economy. Threats can reach beyond theft and espionage to include aspects of cyber warfare that have the potential to disable Australia's electricity grids and air traffic control systems. It is imperative to lift the country's cyber defences.

As a thought leader in the technical and regulatory fields of cyber security, UOW is well placed to provide leadership in helping to enhance cyber security systems across Australia.

LEADING THE WAY IN EDUCATION

The point of difference in UOW's cyber security education is that we have solid foundations in cryptology. This means we are uniquely providing a holistic delivery of education that combines cryptology and applied cyber security.

Importantly, students gain hands-on experience in addition to theoretical learning.

UOW's Institute of Cybersecurity and Cryptology (iC²) has been training the next generation of cyber security professionals for the past 30 years, equipping students with the knowledge to build and secure tomorrow's technological solutions.

The iC² - within UOW's School of Computing and Information Technology - specialises in teaching secure cloud technology, blockchain and IoT, and is one of the leading cyber security research centres in Australia. The institute underpins the offerings of the following degree programs:

- Bachelor of Computer Science (Major in Digital Systems Security)
- Bachelor of Computer Science (Major in Cyber Security)
- Master of Computer Science (Major in Information and Network Security)
- Doctor of Philosophy (Major in Cyber Security)
- Doctor of Philosophy (Major in Cryptography)

UOW is ranked in the top 250 universities in the world for Computer Science & Information Systems, according to the QS World University Rankings by Subject 2021. In the 2020 Good Universities Guide, UOW ranked first in NSW for graduates in full-time employment (85 per cent) in the Computer and Information Systems study area. UOW is also ranked No.1 in NSW/ACT for Skills Development in postgraduate Computing and Information Systems (QILT 2019).

The point of difference in UOW's cyber security education is that we have **solid foundations in cryptology.**



RESEARCH ABOVE WORLD STANDARD

The research work carried out at iC² has been rated as well above the world standard by the Australian Research Council ERA assessment. Importantly, this research is able to be applied to the purpose of what industry needs.

The iC² has two major research divisions. The first is digital systems security, which is centrally focused on cryptology—the construction and analysis of code and protocols in various aspects of information security such as data confidentiality, data integrity, authentication, and non-repudiation. The other is cyber security, which is the state or process of protecting and recovering networks, devices, and programs from any type of cyber attack, including social engineering, advanced persistent threats, and malware or malicious software attacks.

Research areas of the iC² include information security, cyber security, computer and network security, digital signature, encryption, anonymity, cloud and edge security, wireless and mobile security, cryptographic algorithms and protocols, blockchain, multimedia security, quantum cryptography, and post-quantum cryptography. Researchers here also work with UOW's SMART Infrastructure Facility to help guide security within the IoT network, while working within UOW's Faculty of Engineering and Information Sciences to ensure ethical and societal implications of future technologies are considered.

The iC² has been instrumental in contributing to world standards for encryption used within securing wireless technology and is the initiator of the prestigious Annual International Conference on the Theory and Application of

Cryptology and Information Security (Asiacrypt). Its results are widely cited and applied in practice, with continuous funding received from the Australian Research Council, the US National Institute of Standards and Technology (NIST) and industry partners such as DSD, DST Group and Microsoft. Researchers at UOW are also helping to enhance the cyber security and cryptology capabilities of the Australian Defence Force. They are also working successfully in several commercial research projects in the banking sectors and with small and medium-sized enterprises (SMEs).

Director of the iC², Distinguished Professor Willy Susilo, is internationally recognised as a research leader in cryptography and cyber security, and is a former ARC Future Fellow. He is actively engaged with industry and the research community, and was recently elected a Fellow of the Asia-Pacific Artificial Intelligence Association. Professor Susilo's work is cited in 60 international patents from high-profile companies including Microsoft, IBM, Samsung, Nokia, Panasonic, and Mitsubishi Electric Corporation. He has also been elected as a Fellow of the Institute of Electrical and Electronics Engineers, the Institution of Engineering and Technology, and the Australian Computer Society.

Professor Susilo and his team from the School of Computing and Information Technology were recently awarded funding under the Australian Research Council's (ARC) Linkage Projects scheme, to develop encryption technology (homomorphic encryption) to improve data security for cloud computing. This project aims to place Australia at the forefront of efficient cloud adaption for secure collaboration by industry.

UOW is a nexus between government, industry and academia in the development, dissemination and application of innovative cyber security techniques.



BUILDING A PIPELINE OF SKILLED PROFESSIONALS

UOW has secured significant funding from the NSW Department of Education to support the development of the NSW Cyber Academy. NSW Cyber Academy is a partnership between UOW, Deloitte and TAFE NSW, which was established in 2020 with support from the NSW and Federal governments, as well as schools, industry, InvestmentNSW, CyberNSW and AusCyber.

The three partnering organisations have been working together for 12 months to create a Professional Cyber Security Program (Higher Education) that focuses on creating a unique fit-for-purpose post-school cyber security training program that will create hundreds of new jobs in NSW for cyber professionals. The program incorporates an articulated study program from TAFE NSW to UOW while students are concurrently employed by industry or the NSW government. As a tailored cyber security course, the program promotes an increase in the availability and quality of cyber security professionals, while ensuring a wide participation and access to all equity groups.

The partnership provides an opportunity for improved collaboration between industry and education to build the pipeline of skilled professionals for the future.

The iC² specialises in teaching secure cloud technology, blockchain and IoT, and is one of the leading cyber security research centres in Australia.

PARTNERSHIPS DRIVING INNOVATION

UOW is a nexus between government, industry and academia in the development, dissemination and application of innovative cyber security techniques. UOW is one of the founding universities of the NSW Cyber Security Innovation Node, which facilitates access to, and development of, multiple technologies, applications, models and policies that are vital to tackling the current security challenges that Australia faces.

The iC² has worked closely with entities such as the Department of Prime Minister and Cabinet, Australian Signals Directorate (ASD), the Defence Science and Technology Group (part of Australia's Department of Defence), Cyber Security Growth Network (AustCyber), and is engaged with Data61 (CSIRO) on projects that focus on IoT security, blockchain, post-quantum cryptography, and AI-driven cyber security to improve and extend Australia's cyber security capabilities.

Since 2012, research collaborations in quantum cyber security between Sorbonne University in France and UOW have grown from strength to strength. This partnership focuses on building cryptographic protocols, and has led to a number of students from Sorbonne pursuing doctorates at UOW.

Meantime, cyber security has been identified as an initial collaboration point within the NUW Alliance (University of Newcastle, the University of New South Wales, the University of Wollongong, and Western Sydney University). The Alliance is working to provide smart solutions to the issues impacting NSW and has awarded UOW with a grant for a project to develop a cybersecurity visualisation platform for combatting cyber attacks in real-time, and for improving community awareness of cyber threats.



SUPPORTING GOVERNMENT STRATEGIES

Australia's 2020 Cyber Security Strategy includes a series of recommendations that balance between increasing the country's cyber defences, promoting the development of a digital economy, and countering threats to our economy, safety, sovereignty and national security.

The NSW Cyber Security Strategy 2021 focuses on four key commitments of increasing the NSW Government's cyber resiliency, helping the state's cyber security businesses grow, enhancing cyber security skills and workforce, and supporting cyber security research and innovation.

UOW has been successful in gaining funding for the following projects to support state and federal government cyber security strategies:

- Secure and dynamic access control over encrypted data in the cloud. This project aims to enable dynamic access control due to organisational change, which is critical to facilitate the adoption of cloud computing in practice. The expected outcomes will bridge theory and practice, providing economic benefits to industry by enabling practical mechanisms to store confidential user's information in the cloud, hence lowering the infrastructure cost for industry.
- Design and deployment of practical anonymous access systems. This project aims to design, test and deploy a practical and highly secure anonymous access system for online businesses that offer services on a free trial basis. Currently, online businesses are unable to take advantage of feedback from customers during and after trial periods. The project expects to develop innovative cryptographic solutions and security testing methods that will inform new protocol design and implementation, which will bring long-term benefits to online businesses and their customers. The project also aims to develop new, distributed ledger technology, which is a strategic technology trend.

- Enabling anonymity and privacy for blockchain technology in a quantum world. Existing approaches for enabling blockchain applications, particularly with privacy protection and anonymity, are vulnerable to quantum computer attacks. This project aims to enable novel cryptographic mechanisms together with their cryptographic libraries for protecting blockchain in the quantum world, hence, post-quantum secure blockchain. This project has received funding through the Australian Research Council's Linkage Projects scheme. Australia is home to many leading blockchain initiatives, including industry-specific trials for solutions in energy, agriculture, and the public sector. UOW's industry partners on this project are KDDI Research and Tide Foundation.
- Securing public cloud storage with protection against malicious senders. Public cloud storage offers low-cost solutions for small and medium-sized enterprises (SMEs). However, cloud data leakage is a major concern. This project aims to enable secure public cloud storage by developing new practical cryptographic solutions that provide protection against malicious senders. The expected outcomes are innovative technologies, which will lower infrastructure costs and provide cyber security for cloud storage.

UOW is undertaking projects to support state and federal government cyber security strategies.

UOW WELCOMES THE OPPORTUNITY TO WORK WITH GOVERNMENT AND INDUSTRY PARTNERS TO DELIVER EXCEPTIONAL OUTCOMES

CONTACT

Canio Fierravanti

Director Government Relations
University of Wollongong

Ph: 02 4221 5931

E: caniof@uow.edu.au

uow.edu.au



**UNIVERSITY
OF WOLLONGONG
AUSTRALIA**