SPECIAL

TALKING ABOUT COMMUNICATIONS

Featuring some of the very latest in communications technology, ranging from 6G networks to wireless laser communication systems.

CONTENTS

03 Research roundup
06 Shaping SG's science ecosystem
10 Advancing 6G
13 Comms in care
17 Supporting tele-dentistry
19 Next-generation maps

22 Analysing social media
25 Wireless laser comms
28 Fighting fake news
31 Better alternative proteins
35 View on science: Quantum chip off the block

LEADERSHIP
Beh Kian Teik
Chief Executive Officer
Tan Pei Shan
Executive Director
(Policy & Planning)

EDITOR
How Kay Lii

WRITERS
Nur Amin Shah
Lim Jing Wen
Zack Feng

DESIGNER
Nur Amin Shah
Contributors
Centre for Quantum Technologies

RIE NEWS is a publication of the National Research Foundation Singapore, Prime Minister's Office. All rights reserved.

Please send story pitches, ideas, and suggestions to communications@nrf.gov.sg

© 2022 by the National Research Foundation Singapore, 1 Create Way, #12-02, CREATE Tower, Singapore 138602

RESEARCH ROUNDUP

$45M CENTRE FOR ROBOTICS

Nanyang Technological University (NTU) launched the Centre for Advanced Robotics Technology Innovation (CARTIN) to develop affordable, safe, and user-friendly robotics technologies that will reinvigorate and reimagine various sectors in Singapore.

The centre will be led by NTU researchers to develop collaborative and human-centric robotics and autonomous system technologies. These will be applied in logistics, manufacturing, and eldercare. CARTIN will work closely with robotics research entities at the National University of Singapore (NUS) and the Agency for Science, Technology and Research (A*STAR).

Ushering in an era of targeted precision medicine, scientists across A*STAR are propelling the research, commercialisation and implementation of RNA-based therapeutics. These therapeutics operate using engineered nucleotide sequences and have proven to be quick and effective alternative candidates to traditional therapies – from slowing the spread of cancers to speeding up wound healing.

Because just a few thousand of these synthetic nucleotide sequences need to be screened, as opposed to the millions of molecules in typical drug discovery processes, the speedy turnaround of RNA-based therapies narrows the gap between bench and bedside. This is particularly crucial when it comes to global emergencies such as pandemics.
OCBC Bank and NUS will kick off one of the nation’s largest dedicated study to understand the most effective ways to encourage Singaporeans’ adoption of adopt electric vehicles (EV). A total of 32,000 OCBC Bank customers, selected based on the likelihood of them replacing their cars in the coming years, will take part in the three-month study.

The findings will help businesses and organisations accelerate consumers’ adoption of EVs and other green practices. It will also support Singapore’s push to electrify its vehicle population by phasing out petrol and diesel vehicles by 2040.

A team of researchers from NUS has developed a new moisture-driven electricity generation (MEG) device made of a thin layer of fabric – about 0.3mm in thickness – sea salt, carbon ink, and a special water-absorbing gel.

The MEG device has immediate applications due to its ease of scalability and commercially available raw materials. One of the most immediate applications is for use as a portable power source for mobile powering electronics directly by ambient humidity. The researchers have filed a patent for the technology and are planning to explore potential commercialisation strategies for real-world applications.

NTU scientists have invented an invisible coating that can make wood “fireproof”. The new invisible coating developed by NTU allows for the natural beauty of timber to shine and yet can still provide a flame barrier when “activated” by fire. It is low-cost, easy to apply, effective in kerbing the spread of fire and generates very little smoke when burnt.

Just a thickness of about 75 microns – the thickness of a sheet of paper – of the coating is needed to protect the surface of wood from fire. The wood needs to be cured overnight. The NTU team is now in licensing talks with different companies.

A*STAR has signed an MOU with Johnson & Johnson Vision to establish an Eye Health Digital Innovation Consortium. Hosted at A*STAR’s Institute of High Performance Computing (IHPC), the consortium focuses on advancing eye health research in the region in the next three to five years.

The consortium will also look into improving eye health care delivery from eye care professionals to patients in Singapore and beyond, optimising collaboration between the private and public sector. It will also develop new processes to support enterprises involved in primary eye health care delivery.
When Professor Low Teck Seng began his career at the National University of Singapore (NUS) in 1983, Singapore’s science and technology ecosystem was a far cry from what it is today.

“Funding was low and slow to come. If you got $30,000 for a proposal, you were very happy,” he recalled.

“Sometimes it still astounds me that we are now writing cheques for proposals in the tens and hundreds of millions of dollars.”

Earlier this month, Prof Low stepped down as Chief Executive Officer of the National Research Foundation (NRF) after a decade in the post, to return to NUS. He is its Senior Vice-President of Sustainability and Resilience, helming a new initiative to bring together Singapore’s wide-ranging efforts on climate change.

This includes creating synergies and fostering partnerships between various research institutes to tackle crucial issues such as sea level rise.

Two Decades of Driving SG’s Science Ecosystem

Over the past few decades, Prof Low has been at the vanguard of raising Singapore’s science and technology ecosystem to new heights.

He became Dean of NUS’s Faculty of Engineering in 1998, left the university to lead Republic Polytechnic as its Principal and Chief Executive Officer in 2002, and joined the Agency for Science, Technology and Research (A*Star) as its Managing Director in 2010.

Even though he would go on to lead NRF as its Chief Executive Officer for 10 years from 2012, he confessed to hesitating when the position was offered to him.

“I was very excited about our work at A*STAR to push science and technology in support of Singapore’s industries. But I eventually realised, after several discussions, that NRF’s charter was far bigger than A*STAR’s remit. That gave me a new perspective on the job,” he explained.

Looking back on his tenure, he shared that he was proud of seeing two national Research, Innovation and Enterprise (RIE) Plans, namely the RIE2015 and RIE2020 ones, to completion.

“We have created a strong research ecosystem, for Singapore to not only support industries, but build new sectors that we want for ourselves.”

The NRF’s achievement of 10 Global Young Scientist Summits (GYSS), from 2013 to 2022, is another milestone close to his heart.

Prof Low added, “The event is now recognised globally and attracts some of the greatest minds in the world, from Nobel Laureates to Turing Award, Millennium Science Prize winners.”

Prof Low (left) accompanying then Deputy Prime Minister, Minister for Home Affairs and Coordinating Minister for National Security, Mr Teo Chee Hean (right), to the opening ceremony of the 2015 Global Young Scientists Summit (GYSS).
Technology Prize and Fields Medal winners, as well as some of the brightest young minds.”

He noted that the narratives driving Singapore’s science and technology development have evolved over the years.

He said: “I’ve always held the view that, in the early years, a key driver was our economic narrative. We had to build the research ecosystem to support industries.”

“Today, there is a parallel narrative that is equally important: the application of science and technology to solve critical, existential issues that Singapore must face, from ageing to climate change and its impact on the country.”

“...We have created a strong research ecosystem, for Singapore to not only support industries, but build new sectors that we want for ourselves.”

Prof Low Teck Seng

He is still working with NRF, as an advisor, providing guidance on issues relating to science, technology and research.

He said: “I wish NRF well, and hope that the work we will continue to do, will support Singapore’s ambitions, and bring the country to the next bound of where it wants to be.”

In this special, we bring to you some of the latest in communications technology, ranging from 6G networks and social media analytics, to wireless laser communication systems.
ADVANCING 6G

Singapore’s research in 6G communications could lead to breakthroughs in self-driving cars, the metaverse, an “Internet of Senses” and more, says SUTD’s Professor Tony Quek.

Even as countries roll out 5G communications networks, researchers are working on even more advanced 6G networks that could support next-generation autonomous vehicles, virtual and augmented reality, a revolutionary “Internet of Senses”, and more.

Professor Tony Quek, Director of the Future Communications Research and Development Programme (FCP) hosted by the Singapore University of Technology and Design (SUTD), said that the new technology will be much, much faster.

With 5G, for example, it would take 3.6 seconds to download a two-hour movie.

With 6G, it would take just one second to download 143 hours of Netflix shows.

“With 5G, for example, it would take 3.6 seconds to download a two-hour movie. With 6G, it would take just one second to download 143 hours of Netflix shows.”

Prof Tony Quek

“This speed would be a massive benefit to autonomous vehicles, which require high data rates and extremely low latencies, or delays, in processing data,” explained Prof Quek, who is Head of SUTD’s Information Systems Technology and Design pillar.

“You can also have breakthroughs in the metaverse and holograms, such as holographic Zoom meetings.”

An especially intriguing potential application of 6G is the “Internet of Senses”, so-called as people would be able to experience tastes, touches and smells online, in addition to sights and sounds.

This could be done through new and more advanced technologies and devices.

“Just like primary colours combine in different ways to produce a variety of colours, you could have a device with primary smells that mix and match to reproduce smells, for example when you click on a button on a perfume website to find out what a scent smells like,” he said.

National Communications R&D Programme

The FCP, a national, four-year programme with nearly $70 million in funding from the National Research Foundation Singapore and Infocomm
Media Development Authority, is working on several 6G projects.

It has signed a memorandum of understanding with 6G Flagship, a partnership with Finland’s University of Oulu, to explore opportunities for cooperation, such as organising 6G workshops, joint research and education initiatives.

The FCP is also part of SUTD’s artificial intelligence mega-centre, which is a hub for research, teaching and collaboration in the field.

Prof Quek, who is also the centre’s Director, said that AI will be a key part of 6G, and vice versa.

“Many AI applications, including autonomous vehicles and robotics, require connectivity and intensive communication.”

“6G can provide this. Many 6G applications, such as smart transport systems, would also benefit from AI. That’s why it’s natural to put AI and 6G efforts together.”

Prof Quek, who is also SUTD’s Cheng Tsang Man Chair Professor, is studying how to better incorporate AI in wireless communications and security, and terrestrial networks, including 6G ones.

He is also investigating how to boost inter-satellite communications, and better integrate satellite and terrestrial networks, to improve coverage.

He added that Singapore, through the FCP and AI mega-centre, can make its mark in 6G.

“SUTD’s focus on interdisciplinary work makes the programme and centre unique compared to other 6G institutes around the world.”

“Singapore can be a leader in many areas of 6G.”

Prof Tony Quek believes that 6G communication technology speed would be a massive benefit to autonomous vehicles, which require high data rates and extremely low latencies, or delays, in processing data.

SUTD's focus on interdisciplinary work makes the programme and centre unique compared to other 6G institutes around the world.

Singapore can be a leader in many areas of 6G.
"Communication is central to everything a doctor does. When it comes to difficulties such as reduced patient satisfaction, complaints or medical errors, a breakdown in communication is often the problem," said Dr Tanya Tierney, Assistant Dean for Clinical Communication at the Lee Kong Chian School of Medicine (LKCMedicine) at the Nanyang Technological University.

Dr Tierney oversees the school’s curriculum for students to develop communication skills.

Having effective communication skills is more than just about knowing how to deliver bad news to patients, she said.

“It’s also about how you introduce yourself to patients, get permission to have a conversation with them, ask questions to help them tell the story of their illness, give them information about their condition, including how to manage it, handle difficult situations with their family, and share information about patients with your teammates.”

The LKCMedicine curriculum emphasises the value of asking open-ended questions.

"Instead of asking, do you have chest pain, ask patients to tell you what they have been experiencing, and what changes they have noticed. You get more information that way," she explained.

"Listening is key too. When you interrupt the patient or narrow the conversation too quickly, you may miss things."

"Even if you have five patients with the same illness, it may affect their lives in different ways."

Dr Tierney’s work includes finding ways to improve sessions with simulated patients – role-players who act as patients and provide feedback to the students on their communication skills – that are part of the LKCMedicine curriculum.

where simulated patients bring their own children to role-play as patients.

“These give our students the opportunity to practice interacting with children, which they may not have in their own lives, considering their age. We’ve had simulated patients as young as four years old.”

She has also researched and improved simulated patients’ training to better portray language barriers during sessions.

“One thing we focus on now is getting the actors to ask themselves, when the student has asked a question, did the question contain words or have a sentence structure that would have been too difficult for the patient to understand?”

“If so, how should the patient respond? Should the patient misunderstand, look blank, or ask the student to repeat the question?”

Dr Tierney is also collaborating with others to investigate the benefits of mindfulness and self-compassion for healthcare professionals, for their own sake and patients’ care.

She noted that LKCMedicine’s medical humanities course is key to shaping better healthcare professionals too.

“It’s about keeping the role-play realistic for the student.”

“We are also teaching communication skills in tele-medicine, which has become a crucial part of medicine.”

Dr Tierney encourages medical students at LKCMedicine to improve their doctor-patient interactions by improving communication skills. She also finds new ways to improve students’ sessions with simulated patients that are part of the LKCMedicine curriculum.

Medical students at LKCMedicine get opportunities to hone their communication skills through regular interactions with simulated patients. With the introduction of paediatric sessions, these patients bring their own children for role-play with the medical students.
SUPPORTING TELE-DENTISTRY FOR SENIORS

As Singapore’s population ages, more seniors may have mobility issues and difficulty going to the dentist. To safeguard their oral health, National Dental Centre Singapore (NDCS) is piloting a Tele-Dentistry Oral Care for Seniors programme tailored for the elderly who are homebound or living in nursing homes.

NDCS Clinical Associate Professor Christina Sim explained that oral health is integral to general health. “Poor oral health increases the risk of cardiovascular disease and frailty, and leads to or worsens other conditions such as malnutrition, pneumonia and diabetes,” she said.

The two-year programme started last year and ropes in nursing home and home care staff to provide oral care for the elderly.

As Singapore’s population ages, more seniors may have mobility issues and difficulty going to the dentist. To safeguard their oral health, National Dental Centre Singapore (NDCS) is piloting a Tele-Dentistry Oral Care for Seniors programme tailored for the elderly who are homebound or living in nursing homes.

NDCS Clinical Associate Professor Christina Sim explained that oral health is integral to general health. “Poor oral health increases the risk of cardiovascular disease and frailty, and leads to or worsens other conditions such as malnutrition, pneumonia and diabetes,” she said.

The two-year programme started last year and ropes in nursing home and home care staff to provide oral care for the elderly.

It also trials the use of an intra-oral imaging device for tele-dentistry.

The programme is funded by grants from the Temasek Foundation and Singhealth RHS Population Health Development Programme. It currently has 185 participating seniors from three nursing homes and a home care service.

Over two days of training, the staff learn how to assess the elderly’s oral health, including the condition of their teeth, saliva and dentures, how to clean their teeth and take care of their dentures, and how to use the imaging device.

This highlights signs of tooth decay and gum inflammation, and differentiate between old and new plaque, among other functions.
When a senior joins the programme, a dentist carries out an oral examination. The staff then uses the device to take intra-oral scans, and provides the senior with daily oral hygiene and denture care. After the staff uploads the scans along with the senior’s medical history to an electronic records system called e-DENT, an NDCS dentist evaluates the information.

Prof Sim said: “We can suggest diagnoses and treatment plans if necessary. After we send our reports to the staff using e-DENT, they communicate the findings to the seniors and their families.”

“If a dental visit is required and the senior is agreeable, the staff can arrange it.”

After these initial steps, a dentist conducts one follow-up oral examination six months later. The staff then updates the intra-oral scans every six months for the duration of the programme. These updated scans are assessed remotely by the dentist and the updated findings relayed to the nursing staff for follow-up.

Prof Sim noted that this system has many advantages. “Seniors typically see the dentist only after they are already in pain. By then, the problem usually requires complex treatment and may result in tooth loss. With our programme’s regular checks, we can avoid this.”

She added: “Our programme can act as a screening tool to find out who really needs to go to the dentist, boosting efficiency.”

“With the remote assessment, by the time the senior goes to the dentist, the dentist will already know what needs to be done.”

“Ultimately, we hope that our programme becomes mainstream. With tele-dentistry, we can use technology to improve oral care for vulnerable and under-served seniors.”
Accurate addresses are crucial for many services, including location searches, navigation, food and parcel deliveries and mobility solutions.

Still, about four billion people live without an official address, said Mr Xander van der Heijden, Founder and Chief Executive Officer of micro-location and mapping technology firm UNL.

The Singapore-based company has created a smart micro-location and mapping platform, and provides plug-and-play mapping and data tools to power location-based applications and services with location intelligence at hyper-local scale.

“In Indonesia, when an e-commerce shop asks a customer where he lives, he might say, ‘I live in old Jakarta, in this neighbourhood, next to this bank, across from a yellow building.’”

“When the shop makes the delivery, it can use our platform to convert the location into a geocode and assign a unique UNL geoID, which is a precise digital address, for future deliveries and address management,” Mr van der Heijden said.

To develop its platform, UNL produced a virtual map and pixelised the world into a smart 3D grid of cells, to digitise physical locations and give them UNL geoIDs.

On ground, indoor or up in elevation, the UNL cells can be as small as 1 cm by 1 cm for added precision. These can be clustered into shapes to represent real-world buildings and sites.

By using this map, firms can manage and update their own private virtual maps, include and manage their own data about locations and points of interest, and convert vague addresses into accurate geocodes and UNL geoIDs, among other capabilities.

Companies that use UNL’s platform have ownership over their collected data.

“They can choose to give free access to their map to their subcontractors or freelancers, or monetise their data through our data marketplace,” added Mr van der Heijden.

He gave a hypothetical example of two logistics companies that have built up detailed maps of cities in Malaysia and Indonesia respectively.

“They could pay each other and share access to their information through our platform, to aid in their expansion plans.”

He said that UNL’s platform is useful not only in developing nations, where many people live in places without official addresses, but developed ones too.

“Even in Singapore, people write their addresses in different ways. Such non-standardisation is difficult for computer systems to interpret.

“Our platform solves this problem by using geocodes and UNL geoIDs, which are standardised.”

The company is improving its platform so that users can input even more information in their private maps.

“Right now, you can put in basic attributes, such as the building locations, roads, and contextual information such as where to park and access the buildings, said Mr van der Heijden.

UNL’s clients span businesses in Asia, the Middle East and United Arab Emirates, including the central government in India, which is using its technology to bring an EV-ready infrastructure for jaipur-Delhi-Agra E-Highway.

The Singapore government-owned deep-tech ecosystem builder SGInnovate is one of its investors.

Xander van der Heijden, CEO and Founder of UNL, says that the company’s micro-location platform will simply workflows and definitions to enable seamless integration of UN location-based services.

“UNL’s micro-location Platform is designed with simple workflows and definitions to enable seamless integration of UNL location-based services.

“In the future, you will be able to include dynamic data, such as shops’ real-time inventory.”

“UNL’s clients span businesses in Asia, the Middle East and United Arab Emirates, including the central government in India, which is using its technology to bring an EV-ready infrastructure for jaipur-Delhi-Agra E-Highway.

The Singapore government-owned deep-tech ecosystem builder SGInnovate is one of its investors.

Xander van der Heijden, CEO and Founder of UNL, says that the company’s micro-location platform will simply workflows and definitions to enable seamless integration of UNL location-based services.

“In the future, you will be able to include dynamic data, such as shops’ real-time inventory.”

Mr Xander van der Heijden

In the future, you will be able to include dynamic data, such as shops’ real-time inventory.”
A SMART WAY TO
ANALYSE SOCIAL MEDIA

A*STAR’s Ms Therese Quieta and Dr Yang Yinping explain how their new platform Resonance Social can help organisations to track people’s views online.

More people are taking to social media to share their thoughts and feelings on topics such as their commute experiences and new public transport policies.

To better understand such ground sentiments, the Public Transport Council (PTC) and Agency for Science, Technology and Research’s Institute of High Performance Computing (IHPC) have teamed up to develop and test a platform to better analyse online comments.

Resonance Social was conceptualised in 2019 to provide an advanced social listening platform tool for a range of applications, from policy ground sensing to market research and consumer intelligence.

IHPC developed the Resonance Social platform, which can now monitor social media sites such as Facebook and Twitter for public posts and comments on specific topics. It aggregates and analyses these posts and comments to understand the writers’ emotions, the topic dimensions, and their trends of change, and displays its findings and insights on a user-friendly dashboard.

“With Resonance Social, organisations can analyse public online chatter on various topics more easily, said Ms Therese Quieta, Innovation Lead and Senior Research Engineer at IHPC, who is the project manager of the engineering team working on the platform.

“One can get insights, in an aggregated and continuous fashion, on how people feel about a policy or an event, both currently and over time. So one can take better steps to address their views.”

Resonance Social relies on an IHPC technology, called CrystalFeel, that examines natural language text such as online posts or speech transcripts to identify not only the nature but also the intensity of the writers’ emotions.

It measures posts’ content in five dimensions: joy, anger, fear, sadness and valence, which refers to the content’s overall positivity or negativity.

Dr Yang Yinping, Senior Scientist and Group Manager of IHPC’s Affective Computing Group, and Principal Investigator in its Digital Emotion and Empathy Machine Programme, co-invented CrystalFeel, and is leading the backend research work supporting Resonance Social.

She coded the base emotion intensity lexicon that CrystalFeel uses as a source of psycholinguistic feature extraction to analyse the nature and intensity of emotions in online posts.
Transcelestial, a Singapore-based deep tech startup, envisions to use wireless laser communication technology to improve the connectivity experience for the next billion people.

Co-Founder and CEO Mr Rohit Jha shares more.
Communications technology around the world, including Singapore, is mainly dominated by two types of technologies – fiber optic cables and radio waves.

While these technologies laid the grounds for basic communications infrastructure, many challenges remained in ensuring access to connectivity for all. Singapore-based deep tech startup, Transcelestial, aims to overcome this with wireless laser communication technology.

Mr Rohit Jha, co-founder and CEO of Transcelestial, shared that fibre optic cables and radio waves technologies have been around for the past six to ten decades, but innovation in these areas has not grown significantly.

Fast-paced, innovative companies looking to deliver the next generation of internet capabilities are now looking at the potentials of wireless laser communication technology.

He said, “It is no longer enough to just deliver HTML web pages anymore – today’s internet demands high-quality video, low latency game servers, highly responsive business videos, and even more.”

Transcelestial has developed a wireless laser communication device, CENTAURI, that can deliver high-speed internet at up to 10 gigabits per second, by transmitting lasers through the air rather than fiber optic cables.

“It involves accurately beaming a narrow laser as thin as a single strand of hair to a smartphone-sized window that may be 3km away.”

“This must be done with both the laser and the window in movement, while performing reliably in all weather conditions,” explained Mr Jha.

The company had developed the technology and its underlying AI algorithms to point and track laser beams with an enhanced degree of precision.

It can also sense weather conditions and automatically modulate laser power to ensure continuous data transmission, even in unfavourable weather conditions.

Furthermore, the wireless laser communication device also allows for rapid deployment. It weighs less than 3kg and comes in the size of a shoebox, allowing some installations to be completed within half a day.

In comparison, laying fiber cables is significantly more expensive and can take months to get to market.

In Singapore, he highlighted that there is robust existing infrastructure with fiber networks across the island, but there are still applications where extending fiber is not ideal and where wireless laser communication technology can be put to good use.

Their projects also extend globally in the Philippines, Malaysia, India, Indonesia and Australia, which are in various stages of pilots to production deployment.

To further improve connectivity, Transcelestial has their eyes set on delivering high-speed Internet through a laser network in space.

In comparison, laying fiber cables is significantly more expensive and can take months to get to market.

“It involves accurately beaming a narrow laser as thin as a single strand of hair to a smartphone-sized window that may be 3km away.”

“This must be done with both the laser and the window in movement, while performing reliably in all weather conditions,” explained Mr Jha.

The most cost-effective way to deliver a neutral non-telco backbone globally is via a Space Laser Network.

“We feel that a space-based low earth orbit (LEO) constellation can deliver a true intercity or undersea fiber network structure but from space.”

In Singapore, he highlighted that there is robust existing infrastructure with fiber networks across the island, but there are still applications where extending fiber is not ideal and where wireless laser communication technology can be put to good use.

For instance, Transcelestial had seen increasing interest for applications of this technology in defence projects, large campus environments, ports, manufacturing oil and gas, in addition to telecom and internet service providers.

The CENTAURI device weighs less than 3kg and comes in the size of a shoebox, making it easier for rapid deployment.

Their goal is to eventually deliver Internet connectivity up to 100Gbps, hundreds of times faster than conventional speeds today.

Mr Jha said, “The most cost-effective way to deliver a neutral non-telco backbone globally is via a Space Laser Network.”

“We feel that a space-based low earth orbit (LEO) constellation can deliver a true intercity or undersea fiber network structure but from space.”
To combat fake news, create tailored strategies for different demographics, says NTU’s Associate Professor Edson Tandoc.

Society has always dealt with falsehoods such as rumours and conspiracy theories, but social media has enabled disinformation and misinformation to spread more quickly and reach more people, said Associate Professor Edson Tandoc from the Wee Kim Wee School of Communication and Information (WKWSCI) at Nanyang Technological University (NTU). This is worrying as fake news not only misinforms people, but may erode trust in legitimate institutions such as news organisations, said Prof Tandoc, who is also WKWSCI’s Associate Chair of Research and Director of the Centre for Information Integrity and the Internet at NTU.

His research has shown that interventions to combat fake news need to be tailored to specific demographics.

“When we did focus group discussions across different generations, we found that young people and the elderly differ in how they authenticate information,” he said.

“College students said that they usually check with institutional sources, including by doing Google searches, but the elderly said that they typically check with their friends, including via WhatsApp. That was a stark difference.”
He noted that the research underlined the importance of understanding how different groups of people consume and authenticate information, and customising strategies to debunk fake news accordingly.

“We’ve also come up with a computer game to see if gamified interventions may be effective, especially among children.”

Deep dives into people’s fact-checking preferences may yield counter-intuitive findings too. In another research project, Prof Tandoc discovered that people who felt overwhelmed with information about a subject actually preferred longer, not shorter, fact sheets on it.

He said: “One explanation could be that the presence of more arguments works better for them.”

While social media platforms have stepped up efforts against fake news, policymakers need to keep an eye on them and hold them accountable, he added.

“We also need to incentivise people to take action when they see or hear fake news, whether that means flagging social media posts or correcting friends and family.

We need to normalise corrections so that the people being corrected don’t feel offended.

If you tell your parents that what they shared is not true, they shouldn’t feel angry or feel that it’s disrespectful.”

He pointed to Singapore’s focus on fighting fake news, including by funding research such as his work, as a positive step.

“Institutions are enabling important research through capacity building and funding, and all of this helps us to empower the public and individuals in the fight against fake news.”

Fake news is false or misleading information presented as news. Multiple strategies for fighting fake news are currently being actively researched, for various types of fake news.
Scientists from NTU have developed a technique to cultivate a fungi-based food product that could serve as a healthier, better-tasting, and greener alternative to plant-based protein.

Led by Professor William Chen, director of NTU’s Food Science and Technology (FST) programme, the team used edible white mushrooms grown on food waste. This technique enabled the mushroom to absorb essential nutrients such as protein, iron, and amino acids. The result, Prof Chen said, is more nutritious than the ingredients commonly found in plant-based meat alternatives such as peas, chickpeas, wheat, gluten, and soya. A key point that he highlighted is that the overall process also upcycles food waste.

He said, “Upcycling these products to cultivate fungi, a food source familiar to Asian consumers, is an opportunity to enhance processing efficiency in the food supply chain and potentially promote a healthier, non-animal protein alternative to enrich diets.”

Prof Chen also shared that one of the plant-based proteins industry’s challenges is infusing alternative meats with essential nutrients to make them similar or comparable to animal meat.

He stressed that cultivating fungi on food waste, both enhanced its growth and doubled its yield. Compared to commercial methods that may take around a month, Prof Chen shared that the mushrooms were cultivated in just two weeks. “We used mushrooms because they can be grown in the dark and are a lot more energy and water efficient than common crops used for plant-based proteins such as soya beans.”

A key point he highlighted was that the fungi-based proteins could also be much cheaper to produce than plant-based meat: “In addition, being naturally rich in protein and micronutrients like minerals and vitamins, with a texture and taste similar to that of real meat, a lot less processing would be needed to convert the fungi into alternative protein, which also helps bring down production costs.”

Improving mainstream adoption of alternative proteins

The NTU-developed food product, which is based on the edible white mushroom (Agaricus bisporus), would also address several critiques of plant-based protein, which often needs flavouring to be added to taste good, are highly processed, and can lack some essential nutrients, such as iron and amino acids.

The fungi-based food product could stand to be more readily accepted by consumers, as it already resembles meat more than other plant-based proteins, shredding like how cooked chicken would. It also tastes more like meat, as it contains higher levels of amino acids, glutamic and aspartic acids, compounds that commonly occur in animals, which give their flesh that trademark ‘meaty’ flavour.

“We are motivated by our close ties with the industry to translate our findings into solutions for pressure points for today’s food & beverage producers, such as improving the flavour, nutrition, and sustainability profiles of their products,” added Prof Chen, who is also the Michael Fam Endowed Chair Professor in Food Science and Technology.

“Nature, in the form of fungi, is a powerful tool to help corporations cut down on waste and potentially improve human diets, but they require research and innovation, which we are glad to provide, to bridge that gap.”

International partnerships to get things going

To scale up their fungi-cultivation method, the NTU team, which also includes PhD student Mrs Malsha Samarasiri at NTU’s FST programme, is collaborating with The FOODBOWL.

It is part of the New Zealand Food Innovation Network – a national network of open-access food processing facilities supported by the New Zealand government to help food businesses and startups globally innovate, scale up and commercialise, and ultimately internationalise new products.
Pictured here is a quantum computing processor designed and made in Singapore. The outer golden rectangular ‘frame’ houses all the connections to the quantum bits. These bits are deposited aluminium patterns on the silicon wafer that appears as a grey square in the middle.

The quantum processor was developed through a collaboration between researchers from the Centre for Quantum Technologies at NUS, and NTU. It is now being developed for Singapore’s National Quantum Computing Hub that was announced in May 2022.

Mr Grant Verry, Chief Executive of The FOODBOWL said: “We are excited to be able to support global innovation here at The FOODBOWL to develop more nutrient-rich alternative proteins by utilising local waste streams.”

“New Zealand and Singapore already have strong collaborative agreements in place and this project is another great example of the value such relationships can deliver for both country’s economies and overall food systems, with industry lead and government enabled innovation for the food sector.”

One New Zealand startup collaborating with the NTU team to implement the fungi cultivation technology in its food products is Off-piste Provisions, a plant-based meat company.

Besides playing an advisory role to startups, the researchers at NTU’s FST programme hope to develop their product to further boost its nutritional profile, as well as reduce food waste.

The NTU team hope to commercialise their solution by 2024.

A freshly sprouted oyster mushroom, which takes not only less time to grow when cultivated from a base of food by-products (waste), but is more nutritious than its commercial counterparts.

Image: Centre for Quantum Technologies at NUS

One New Zealand startup collaborating with the NTU team to implement the fungi cultivation technology in its food products is Off-piste Provisions, a plant-based meat company.

Besides playing an advisory role to startups, the researchers at NTU’s FST programme hope to develop their product to further boost its nutritional profile, as well as reduce food waste.

The NTU team hope to commercialise their solution by 2024.
NATIONAL RESEARCH FOUNDATION
PRIME MINISTER’S OFFICE
SINGAPORE