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FUSION
THE POTENTIAL OF TECHNOLOGY AND DESIGN

SUTD
SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

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PHOSPHENE, A SINGAPORE
NIGHT FESTIVAL LIGHT ART INSTALLATION
DESIGNED BY SUTD STUDENTS

SUTD'S GROWTH PLANS BEYOND 2020

With the support of the Ministry of Education, SUTD has set aside a multi-million dollar budget for its next phase of growth.

New integrated, multi-disciplinary programmes in four key areas — Healthcare, Cities, Artificial Intelligence/Data Science, and Aviation — will be developed in the next five years to enhance SUTD's education and research offerings.

In the Healthcare sector, for example, SUTD is partnering Duke-NUS Medical School to offer an SUTD-DUKE-NUS Special Track to nurture future clinicians who are adept at both practising medicine and harnessing cross-disciplinary technological advancements to impact healthcare. SUTD will also expand its partnership with Changi General Hospital to develop more specialised undergraduate programmes and courses in healthcare-related disciplines, and provide more incubation and test-bedding opportunities to facilitate research, innovation, and enterprise efforts, especially in the medical technologies start-up cluster.

With such partnerships, students will be able to gain deeper real-life knowledge and relevant industry work experience, more research and development exposure and internship opportunities with both local and overseas companies, which ultimately lead to better career prospects.

SUTD Chairman, Mr Lee Tzu Yang said: "SUTD's next phase will tightly integrate education, research, innovation and enterprise. It will also build on our robust technology and design curriculum to meet the future needs of industry and government. We will greatly widen our current level of collaborations beyond the current 700 companies for projects and student internships. Our aim is that every SUTD graduate is not just ready for the future economy but will create the future through technology and design."

MOU WITH IMD TO DEVELOP A SMART CITIES INDEX

(Left) IMD's President, Prof Jean-François Manzoni, (Right) SUTD Provost, Prof Chong Tow Chong

(From left) LKYCIC's Poon King Wang and Prof Chan Heng Chee, IMD President, SUTD Provost, Dr Bruno Lanvin from INSEAD and Sree Kumar from LKYCIC

The term 'Smart Cities' is commonly used nowadays, but how does one actually define a Smart City? This is an important question that needs to be addressed as global cities start becoming smarter with the implementation of technologies and big data analytics.

Hence, SUTD and top-ranking business school, International Institute for Management Development (IMD), signed an MOU on 23 November to spearhead the development of a new Smart Cities Index. The Index intends to provide insight into how cities could be smart by learning from leading cities. It will act as a global index that covers all regions in the world and provide recommendations on how a smart city should promote inclusiveness beyond mere deployment of technology. The Lee Kuan Yew Centre for Innovative Cities (LKYCIC) at SUTD will be working with IMD on this research.

SUTD's Provost, Professor Chong Tow Chong said: "We are very pleased to collaborate with IMD on the Smart Cities Index project. As smart cities will be the norm in the near future, this index will serve as an effective and well-recognised guide to help improve cities worldwide, through technology and design."

IMD's President, Professor Jean-François Manzoni said: "The collaboration between IMD and SUTD holds the promise of a very exciting project. The Smart Cities Index that will be developed as a result should be the global benchmark in which cities, businesses, citizens and other parts of civil society can find a unique resource to identify best practices and to design and implement their own strategies for the world of tomorrow."

SUTD RANKED TOP 5 IN TELECOMS RESEARCH — CLARIVATE

In the 2017 State of Innovation Report released by Clarivate Analytics, SUTD was ranked the fifth-most influential scientific research institution in telecommunications, based on the citation impact of research papers. SUTD was the only non-US institution to make the top 10 list, ahead of Princeton University and Carnegie Mellon University in the United States. It is also the first time SUTD has made it to a top 10 list in the State of Innovation report.

Clarivate analyses year-on-year research and patent activity in 12 industries, including aerospace and defence, automotive, biotechnology, cosmetics, information technology, medical devices and semiconductors and telecommunications, among others.

IEEE Fellow, Associate Professor Tony Quek from the Information Systems Technology and Design pillar was named a 2017 Clarivate Analytics Highly Cited Researcher in the field of Computer Science. He is one of 26 Highly Cited Researchers in 2017 named from Singapore institutions. The Highly Cited Researchers list represents some of the world's most influential scientific minds, based on a series of proprietary, citation-related metrics. Being a Web of Science Highly Cited Researcher is a prestigious designation. These researchers have distinguished themselves by publishing a high number of papers that rank in the top 1% most-cited in their respective fields over a recent 11-year period. Such consistent production of highly cited reports indicates that the work of these researchers have been repeatedly judged by their peers to be of notable significance and utility.

Associate Prof Tony Quek

Associate Provost for Research, Professor Martin Dunn said: "SUTD is delighted to receive this independent recognition of our research impact. While rankings are not our primary concern, it is a very positive signal of success of the research efforts of our faculty, staff, and students - largely through our Temasek Labs, iTrust, and International Design Centres - to impact Singapore's Smart Nation initiative in a strategic and focused way, consistent with our youth, small size, and emphasis on integrating innovative research and education in technology and design. We are confident the future will hold more and more diverse indicators of our impact."

PORTABLE CYTOMETER FOR RAPID MALARIA DETECTION
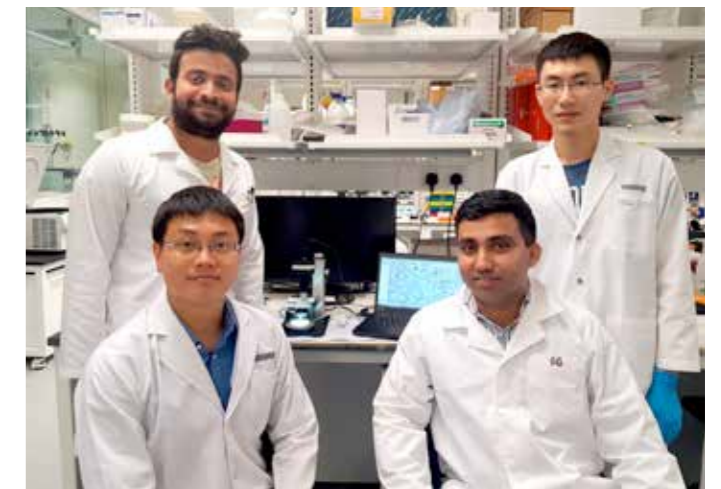BY RAJESH CHANDRAMOHANADAS
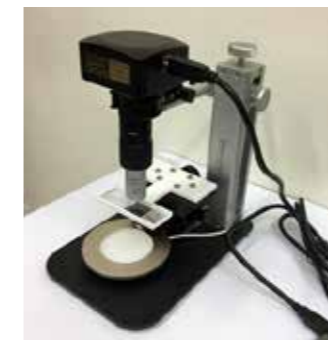
New portable and cost-efficient imaging cytometer

In resource poor-areas, malaria detection generally relies on manual microscopic investigations of blood smears collected from patients. Other existing methods require sophisticated instruments, highly trained personnel, expensive reagents or complicated sample and data processing steps. However, a recent research breakthrough led by SUTD Assistant Professors Dr Ye Ai and Dr Rajesh Chandramohanadas, has simplified the malaria detection process.

Supported by graduate students, Dahou Yang and Gowtham Subramaniam, the SUTD research team developed a new portable and cost-efficient image-based cell counter that can accurately detect malaria. The newly developed cytometer relies on acquisition of images from Giemsa-stained blood smears followed by automatic parasitemia estimation with a sophisticated image processing algorithm. By evaluating the area occupied by the parasite within an infected red blood cell, the device can estimate the level of infection (referred to as parasitemia) with high accuracy and precision.

The image-based cytometer, which costs approximately US$600, is capable of detecting malaria parasites at infections as low as 0.2% with high accuracy and comparable efficiency to that of a high-end commercial flow cytometer that costs around US$100,000;

Front: Dr Ye Ai (left) Dr Rajesh Chandramohanadas (right) and Back: Graduate students Gowtham Subramaniam (left) and Dahou Yang (right)

a much cheaper alternative for antimalarial testing in research laboratories as well as field diagnosis of malaria.

Dr Ye Ai said: "This portable image-based cytometer has great potential as an accurate and cost-effective tool for routine malaria diagnosis in the field or resource-limited regions."

Dr Rajesh Chandramohanadas added that besides being portable and smaller in size, the new cytometer could also detect very low levels of infection from laboratory samples.

This research was published in science and medicine journal PLOS ONE.

WINNING THE "FAKE NEWS" HACKATHON
BY TIMOTHY LIU

(From bottom left): Team Hello World – Brandon Ong, Khong Jia Wei, Timothy Liu, Fariha Ahsan;
(Row behind Google logo from left): Team Real News Today – Grace Tan, Chia Yew Ken, Ian Lowe, (Team Hello World) Tong Hui Kang

On 14 October, around 140 tertiary students participated in a hackathon to tackle the scourge of fake news, which saw a team of five SUTD Freshmore (first year) students, Timothy Lui, Brandon Ong, Tong Hui Kang, Khong Jia Wei and Fariha Ahsan, emerge with the winning idea.

Team leader Timothy shared that the hackathon, organised by NUS, SUTD, Google and the Media Literacy Council, was a fantastic learning experience and provided a great platform for the team to hone their technical and presentation skills. The students were paired with senior journalists as mentors and worked at the well-designed Google Asia-Pacific HQ.

The team first thought about how they could distinguish 'real news' from 'fake news'. The language features of an article is one of the many indicators of sensationalised or fictional news articles. Next, by experimenting with different open-source natural language processing (NLP) algorithms to analyse several articles, the team found one that gave an optimal result that allowed them to estimate the reliability of the article.

They then decided to take a data-driven approach to the problem, creating a database of Singapore news articles, and running every article through the algorithm. Through this, the team was able to rank Singapore news sources by their reliability, and the results matched their expectations to a great extent. For example, Channel NewsAsia was ranked the most reliable, while "alternative" sites such as All Singapore Stuff were ranked poorly.

As a proof of concept, the students created a Google Chrome browser extension that could access their database and indicate to the user if the current article being viewed was reliable or not.

To further improve the accuracy of their estimates (given as scores), the team also proposed creating an online, gamified social platform to help gather user feedback on news articles by allowing them to modify the scores using a voting system. The platform also served as a means to generate a properly labelled data-set of reliable news and 'fake news' for researchers to develop better algorithms to combat 'fake news'.

SUTD's Head of Humanities Arts and Social Sciences, Professor Lim Sun Sun, who was also one of the judges at the hackathon, said: "The judges were very impressed by the team's solution because it reflected a firm understanding of the technical tools that can be harnessed to limit the dissemination of fake news, but also the social nature of communication that accelerates its rampant spread. Their multi-pronged solution was therefore the clear winner."

BRAIN INSPIRED COMPUTING AND APPLICATIONS
BY CHAN LUO QI, HONG PENGFEI, HUM QING ZE

A team of SUTD students received the first prize for the First National Collegiate and International Invitational Tournament on Brain Inspired Computing and Applications held by Tsinghua University in Beijing on 14 & 15 October 2017. The team consisted of three freshmores, Hum Qing Ze, Chan Luo Qi and Hong Pengfei. A total of 229 teams from 47 institutions signed up for the competition, with only 16 teams shortlisted for the finals.

The SUTD team's project entitled the Face of Fonts: 字之魂, aimed to discover the semantic meaning behind fonts and apply it to design. The team decided to explore their hypothesis using neural networks and managed to develop a font recommendation system that acts as a first-cut for typographic designers.

After a roadshow and a final presentation, the team managed to clinch the first prize worth RMB 120,000 yuan about S$24,500).

On recounting his experience, Hum Qing Ze said: "The past three months had been an immensely humbling journey for us as we were freshmores navigating the foreign field of neural networks. We had to continually push ourselves to think out of the box while working on this project. With the immense support and mentorship from our professors, we managed to further improve on our research methodology to achieve viable results."

(From left) Chan Luo Qi, Hum Qing Ze, Prof Shi Luping (Tsinghua University), Hong Pengfei, receiving the first prize at the First National Collegiate and International Invitational Tournament on Brain Inspired Computing and Applications

Machine learning was also a new topic to them and they had to quickly pick up the broad strokes of the multitudes of algorithms, each with their own strengths in classification and efficiency, in order to develop their font recommendation system. Going forward, the team hopes to continue developing their research.

SINGAPORE NIGHT FESTIVAL 2017

This year, two SUTD teams were commissioned to put up light installations as part of the Singapore Night Festival (Night Lights 2017). The annual event is organised by the National Heritage Board and the unique light installations had to fit the theme "10 Magical Years" – which was how long the Singapore Night Festival has been running.

The two installations were 'Phosphene' by Praxis+ and 'Tessellations of Time' by Litewerkz.

Phosphene designed by Praxis+

The inspiration for Phosphene came from the biological phenomenon of seeing speckles of light without light being physically present or entering the eye. People sometimes experience this when they close or rub their eyes. The installation is a dark winding tunnel of dazzling lights that aimed to bring wonder, joy, curiosity and surprise to visitors at every turn as they wander through the faceted and reflective interior. Every panel in the tunnel is unique and parametrically designed. Advanced digital fabrication is used to manage costs while ensuring a high quality bespoke experience.

Praxis+ comprised a group of 10 third year students and had a mix of architects, engineers and computer scientists working at the intersection of art, technology and design in their SUTD course to craft meaningful human-centred experiences. The students formed this group as friends interested in putting what they have learnt into practice through projects such as this.

Praxis+ Team

Inside Phosphene

Tessellations of Time designed by Litewerkz

Tessellations of Time was inspired by the precious bridges of memory built between people and time. It aimed to visualise the nature of memories and how one could celebrate and reminisce the 10 illustrious and "magical years" of the Singapore Night Festival. As each pod represents a juncture

A prototype of Tessellations of Time Pod

Tessellations of Time installation

between the past and future, the Litewerkz team wished that every person who entered a pod would remember the brilliance of their former years and exit it with the conviction to make the next year a better one.

Litewerkz also comprised 10 third year students from various SUTD pillars. This is the second consecutive year that Litewerkz has put up a light art installation at the Singapore Night Fest. Their previous light art installation was the very well-received #showerthoughts in 2016.

SUTD AND KEYSIGHT SIGNED S$10MIL MOU AND OPENED JOINT LAB

(From left) President of Keysight's Electronic Industrial Solutions Group and Senior VP of Keysight Technologies Inc., Mr Gooi Soon Chai and SUTD President, Prof Thomas Magnanti signed the MOU with Minister for Trade and Industry (Industry) Mr S Iswaran as witness

Keysight engineers and SUTD researchers explaining the operations of some of the measurement equipment

SUTD and Keysight Technologies Inc. signed an MOU to collaborate on research as well as opened the new Measurement Technologies Lab (MTL). Keysight donated S$8 million worth of cutting-edge equipment to the lab, and another S$2 million in research grants, to accelerate research and development in advanced manufacturing, data analytics and Internet of Things (IoT) security.

Mr S Iswaran, Minister for Trade and Industry (Industry) was the guest-of-honour at the ceremony held at SUTD on 6 December.

The collaboration with Keysight is part of SUTD's strategy to work with industry partners to drive research and innovations that contribute to Singapore's Smart Nation initiatives.

SUTD's President, Professor Thomas Magnanti, said: "We are very pleased to collaborate with Keysight, not only in research but also to set up this new Measurement Technologies Lab. Such an industry-academia collaboration is mutually beneficial as through research, new innovations in measurement and testing will arise. Meanwhile, the Lab gives our students, faculty and researchers access to state-of-the-art testing and measurement technology, which will enhance their industry relevant knowledge and skills, to become technically grounded innovators who can help create a better world through technology and design."

Minister S Iswaran visiting the Measurement Technologies Lab

Researchers at the MTL will leverage on the equipment donated by Keysight as well as work with the company's technology and industry experts to conduct research that is relevant for Smart Factories of tomorrow (also known as Industry 4.0). These projects, incorporating the latest developments in security, Big Data analytics and Internet of Things (IoT), will focus on:

• Addressing the diminishing test access of printed circuit boards (PCB) and advance the development of fault detection and fault isolation
• Harvesting Industry 4.0 manufacturing big data, develop advanced predictive and machine learning algorithms, and advance anomaly detection and identification
• Strengthening the cyber-physical security of Industrial Internet of Things (IIoT) devices and systems against malicious threat.

These projects will help translate into better quality products, smarter utilisation of resources, improved efficiency, productivity and security.

President of Keysight's Electronic Industrial Solutions Group and Senior VP of Keysight Technologies Inc., Mr Gooi Soon Chai, said: "Today's convergence of technology domains and the explosion of electronic content everywhere is driving the entire industrial eco-system into a whole new dimension. Organisations are facing tremendous pressure to keep up with the accelerating pace and complexity of today's advancements. Keysight, as the world's leader in electronic measurement, is collaborating with SUTD, with its multi-disciplinary research talents, to reimagine innovation that will help the world's organisations today face these challenges and deliver their products and services, faster, better and safer."

SUTD AND ST ENGINEERING LAUNCHED THE CENTRE FOR SMART SYSTEMS

(From left) SUTD Associate Provost for Education, Prof Pey Kin Leong, SUTD Co-Director of Centre for Smart Systems, Prof Costas Courcoubetis, ST Engineering Chief Technology Officer, Mr Fong Saik Hay, SUTD Provost, Prof Chong Tow Chong, ST Engineering CEO, Mr Vincent Chong, ST Engineering's Co-Director of Centre for Smart Systems, Prof Lim Hock Beng, SUTD Associate Provost for Graduate Studies & International Relations, Prof Yeo Kiat Seng

One of 11 research centres and laboratories at SUTD, the Centre for Smart Systems was set up as part of a joint collaboration between ST Engineering and SUTD to address challenges and meet the needs of growing Smart Cities worldwide. The Centre was officially launched by SUTD's Provost, Professor Chong Tow Chong and ST Engineering's Chief Executive Officer (CEO), Mr Vincent Chong, on 21 November. Currently, the Centre has about 10 R&D projects and some of the key research areas it focuses on include Smart Digital Manufacturing, Smart Automation and more.

The Centre for Smart Systems has incorporated a versatile operating model, which streamlines the research to commercialisation process. With a collaboration and intellectual property framework in place, joint projects between SUTD and ST Engineering can be executed more easily.

At the launch, SUTD's Provost, Professor Chong said: "The Centre for Smart Systems is a one-stop centre with innovative capabilities and conducive research environment that encourage more research collaborations between SUTD and ST Engineering. I believe this is a win-win position for both organisations and hope that more researchers and engineers will come together to propose ideas and solutions that would positively impact Singapore and help better the world."

ST Engineering's CEO, Mr Chong said: "We are pleased to find a strategic and synergistic partner in SUTD. In fact, we have been working with SUTD over the past two years – not just on this Centre for Smart Systems, but also on a Corporate Lab for Cyber Security. SUTD takes a problem-solving approach in both its teaching and R&D methodologies. This is well aligned with the problem-solving approach that ST Engineering takes towards business improvements and innovations."

REACHING OUT TO SPACE

BY JERRY NEO

NASA astronaut Commander Jeffrey Williams sharing his experience in space

The man of many hats, retired United States army officer, test pilot and veteran of space flights, Commander Jeffrey Nels Williams, gave a "Masters of Technology and Design" lecture at SUTD on 2 August. In his presentation, Commander Williams challenged the audience to be a part of space research and exploration, and to innovate in the multitude of domains that can help advance man's understanding of our universe.

Commander Williams first spoke about the human desire to invent and create, and to find out the answers to the phenomenon around us. He explained that this desire was what led man toward exploration, and space exploration is the current chapter in this development. He elaborated on the effort put into the construction of the International Space Station (ISS) and what the unique environment of space has to offer to research; by taking gravity away and looking at the basics of physics and biology. On the topic of research, Commander Williams shared that besides conducting experiments on the ISS, he was also a test subject on the ISS and explained how it allows the study of human development in space which is of paramount importance for future space explorations. He also shared that it is possible for students to send research projects up onto the ISS through the company NanoRacks and encouraged students to try it out.

The man who went to space and returned safely six times then went on to describe how it was like to fly towards and stay onboard the ISS. He shared his experience as part of the 47/48 expedition and on the kind of work they do onboard, such as managing supplies, research, testing of new equipment and space walking.

Overall, Commander Williams was able to inspire and intrigue the audience with his eye-opening lecture. His presentation was well paced and well delivered with the help of the many photos taken by the commander himself during his stint in space. I was privileged to hear from the man at the forefront of human exploration and am pleased to know that space is within our reach.

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