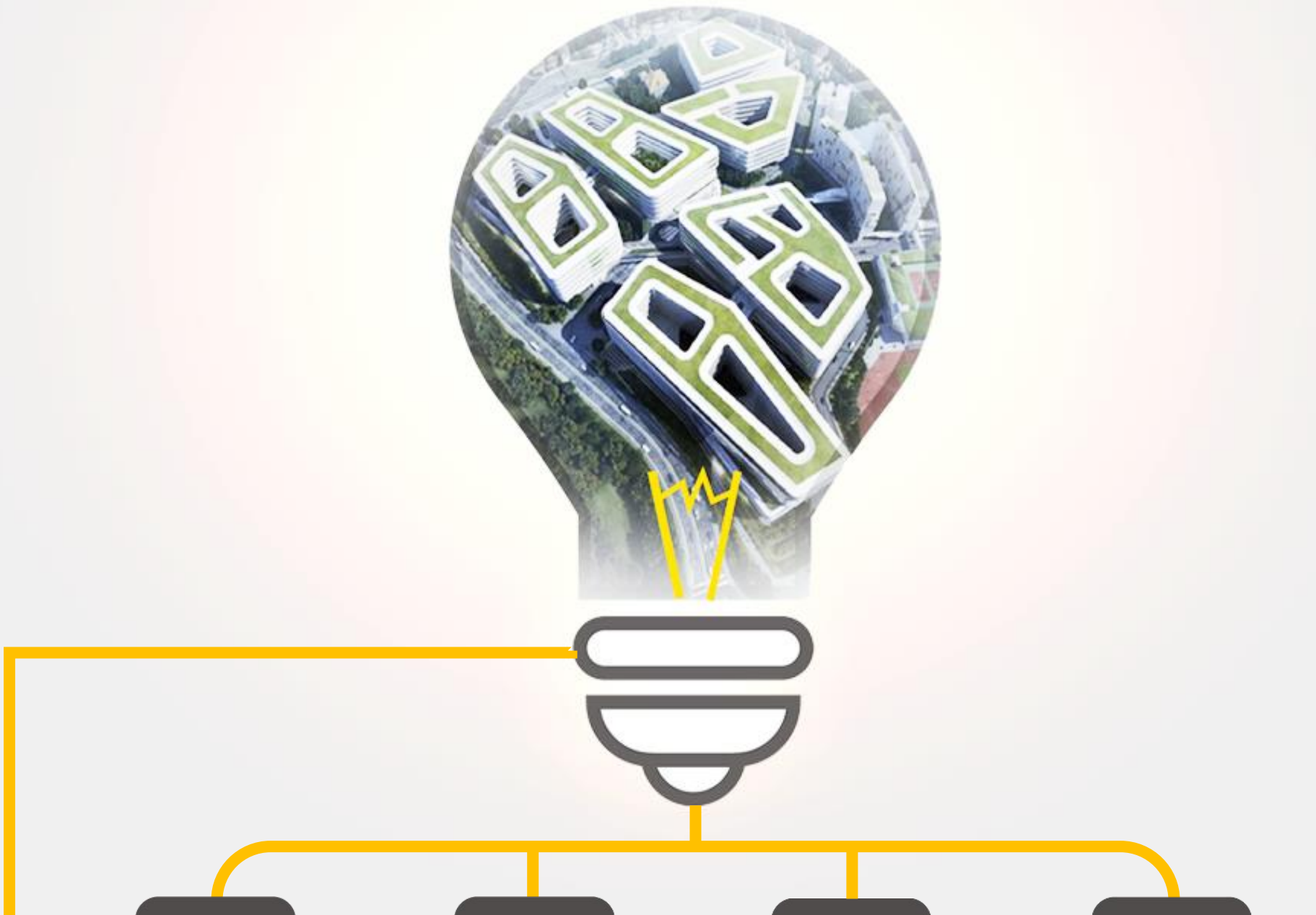
ASPIRE

SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

An **S**UTD **P**ublication : **I**mpactful **R**esearch **E**ndeavors



TOP Research @ SUTD

:: **T**alent :: **O**pportunities :: **P**artnerships

2019 | Vol. 1

Preface

Professor Chong Tow Chong
President, Singapore University of Technology and Design (SUTD)

With this year being SUTD's 10th anniversary, our inaugural issue of *ASPIRE* could not be more timely to mark our distinctive research achievements and the bold culture of innovation we have cultivated over the years.

Staying true to our mission to build a better world by design, SUTD has set aside a multi-million dollar budget to spearhead our next phase of growth in four key areas - Aviation, Cities, Healthcare and Artificial Intelligence/Data Science. We are also investing in strategic research collaborations with industry, government and academia to develop state-of-the-art technologies and transformative capabilities in these sectors, thus enabling us to be future-ready in our rapidly changing world.

In each issue of *ASPIRE*, you will gain insights into the multi- and inter-disciplinary research that faculty, students and staff have been involved in and the impact they have created.

As we continually sharpen SUTD's role as a catalyst for excellence in research and innovation, we welcome your thoughts and ideas for collaboration. Together, we can aspire to better the world, one research endeavour at a time.

Content

Talent :: **O**pportunities :: **P**artnerships

SUTD partners CAAS to establish the Aviation Studies Institute

Professor Chong Tow Chong, President, SUTD (left) and Mr. Kevin Shum, Director-General, CAAS (right) at the signing ceremony.

*Over the next five years, CAAS will provide **S$11.6M** to fund the aviation and Air Traffic Management (ATM) policy research undertaken by the Aviation Studies Institute (ASI), as well as aviation experts for research projects. This facility will be the first ATM research and development institute established to focus on operational, economic and policy research.*

The Civil Aviation Authority of Singapore (CAAS) and the Singapore University of Technology and Design (SUTD) have signed a Memorandum of Agreement to establish an Aviation Studies Institute (ASI) to advance ATM Research and Development (R&D) in Singapore. The agreement was signed by Mr Kevin Shum, Director-General, CAAS and Professor Chong Tow Chong, President, SUTD, on the sidelines of the World Civil Aviation Chief Executives Forum, held at the Singapore Aviation Academy on 9 April 2019.

The ASI, to be located within SUTD's campus, will be the fourth facility dedicated to ATM R&D established in Singapore and the first to focus on operational, economic and policy research. This complements and enhances SUTD's aviation focus in research and education, and offers students a macro view of the aviation system, and a deeper understanding of its value creation to stakeholders. For a start, the ASI will conduct research in the following four areas: Network Capacity, Airfield Management and Economics, Airport Connectivity, and Information Sharing and Collaborative Decision Making.

Scan me More information can be found here

Contact ASI Director Professor Peter Jackson at peter_jackson@sutd.edu.sg

Tackling digital disruption:
Industry transformations and workforce resilience

Photo Credit: Today Online

Professor Lim Sun Sun, Humanities, Arts and Social Sciences

Research by universities, consultancies, corporations and non-profit organisations indicate growing concern about the impact of technology disruption on work. Singapore has also made this issue a top priority. At the 2017 Committee of Supply debates, Minister-in-Charge of the Smart Nation Initiative, Dr Vivian Balakrishnan, stressed that the "accelerating digital revolution… is going to disrupt jobs" and the government's top priority is "jobs, jobs, jobs." Singapore is thus investing heavily in job creation and matching, and skills re-training and upgrading.

*SUTD collaborated with NUS and SMU on a **S$2.1M** Social Science Research Council (SSRC) grant that seeks to examine the impact of digital disruption on work in the manufacturing, finance and banking sectors. The goal is to understand how organizations and workers can adopt, adapt and master these technologies to increase productivity. The insights from this project can inform Singapore's response to the impact of digital disruption and suggest how we can capitalise on such disruption to create new jobs while supporting workers through the transition.*

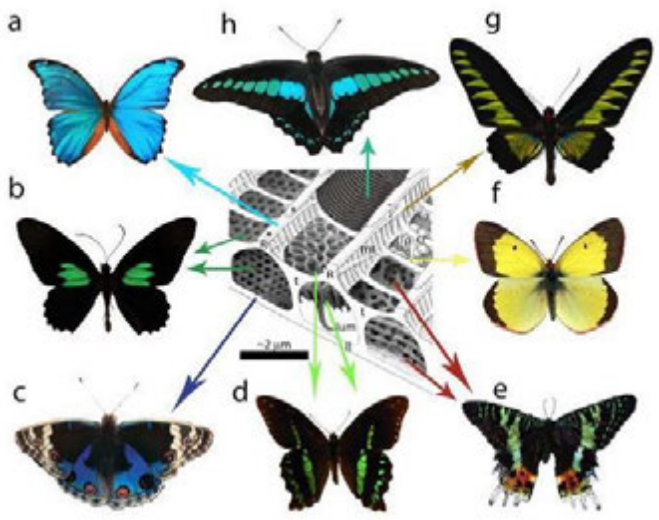
Hence, as Singapore journeys towards being a Smart Nation and Digital Economy, there is a need to able to track and tackle how this digital disruption will impact and change Singapore's economy and society. Singapore needs to take prompt and concerted action to ensure that our workforce is resilient, the economy is competitive, and society is not beset by potential digital divides. The occupation task database for Singapore created through this research program will be the first such database in Singapore and Asia. It will be augmented by ethnographic research examining how workers are coping with digital disruptions and how organisations are supporting their employees along the way. Organisational surveys will also be conducted to capture the attitudes, concerns, policies and interventions that are emerging in response to these disruptions.

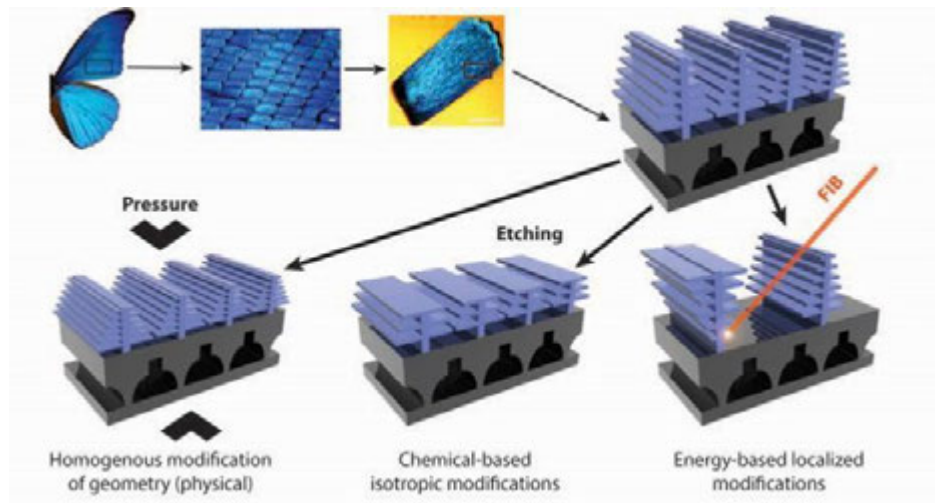
The project's social science approach will also be complemented by insights from engineering and data science. It is expected that the study's findings will be timely and wide-ranging, enabling the formulation of recommendations that can inform programs and initiatives that support the upskilling and training of the workforce. These include the Ministry of Trade and Industry's Industry Transformation Maps, the Ministry of Manpower's Professional Conversion Programme and the Ministry of Education's SkillsFuture initiative.

Photo credit: Kelman Chiang, SG Photobank

Contact Principal Investigator Professor Lim Sun Sun at sunlim@sutd.edu.sg

From genes to products:
Study and application of butterfly structural colors for biomimetic manufacture potential





Picture Credit: Javier G. Fernandez, Joel Yang, SUTD

$2.1M *NRF-CRP grant to study application of butterfly structural colours for biomimetic manufacture potential.*

Assistant Professor Javier G. Fernandez, Associate Professor Joel Yang, Engineering Product Development Pillar

Despite the urgent ecological need for sustainable materials, and the large diversity of biodegradable materials with desired physical properties such as color, texture and mechanical strength, the use of biomaterials in engineering remains extremely limited compared with their synthetic counterparts. The reason for this lack of integration is our dire lack of knowledge of the design principles of biomaterial organization and the ability to reproduce them with our current approaches. To make progress in this multi-disciplinary field, the research team needs to uncover the principles of organization of natural materials, understand how they achieve their color and mechanical characteristics, and then either bio mimetically develop the tools to manufacture them using biodegradable materials or use cell-based approaches to synthetize those materials in the petri dish.

The results from this project will facilitate a better understanding of function and development of colors in biological systems and generate knowledge to enable biomimetic design and fine control of biodegradable materials for multi-functional applications. The most immediate use-case application is the development of safe cosmetics, in particular chitosan microflakes containing structural color that can be used in eye shadow, skin highlighters, and lipstick colors. While the focus of this project is on structured surfaces and films, a common approach for the production of microflakes is by pulverization of thin films.

Global Make-up market is worth around USD $70 billion and is projected to grow by about 5% each year. Interestingly, the Color Cosmetic Market including nail, lip, eye makeup, facial makeup, hair color, special effects and other products, will reach $77.7 billion by 2020, growing at a compound annual growth rate (CAGR) of 5.7%. Singapore would be a world leader is the use of this safe, biodegradable compound in cosmetics.

In such a highly plastic-rooted economy such as Singapore, there is a need for the country to be a forerunner in the development of sustainable technologies that will go a long way in reducing global carbon footprints and towards a greener future.

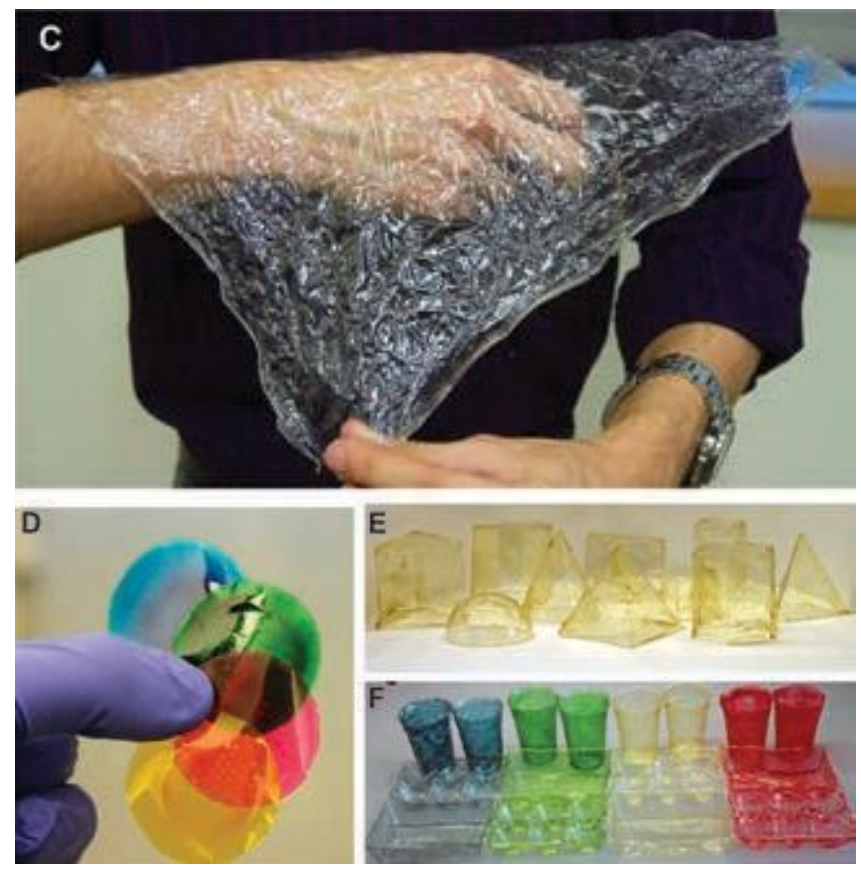
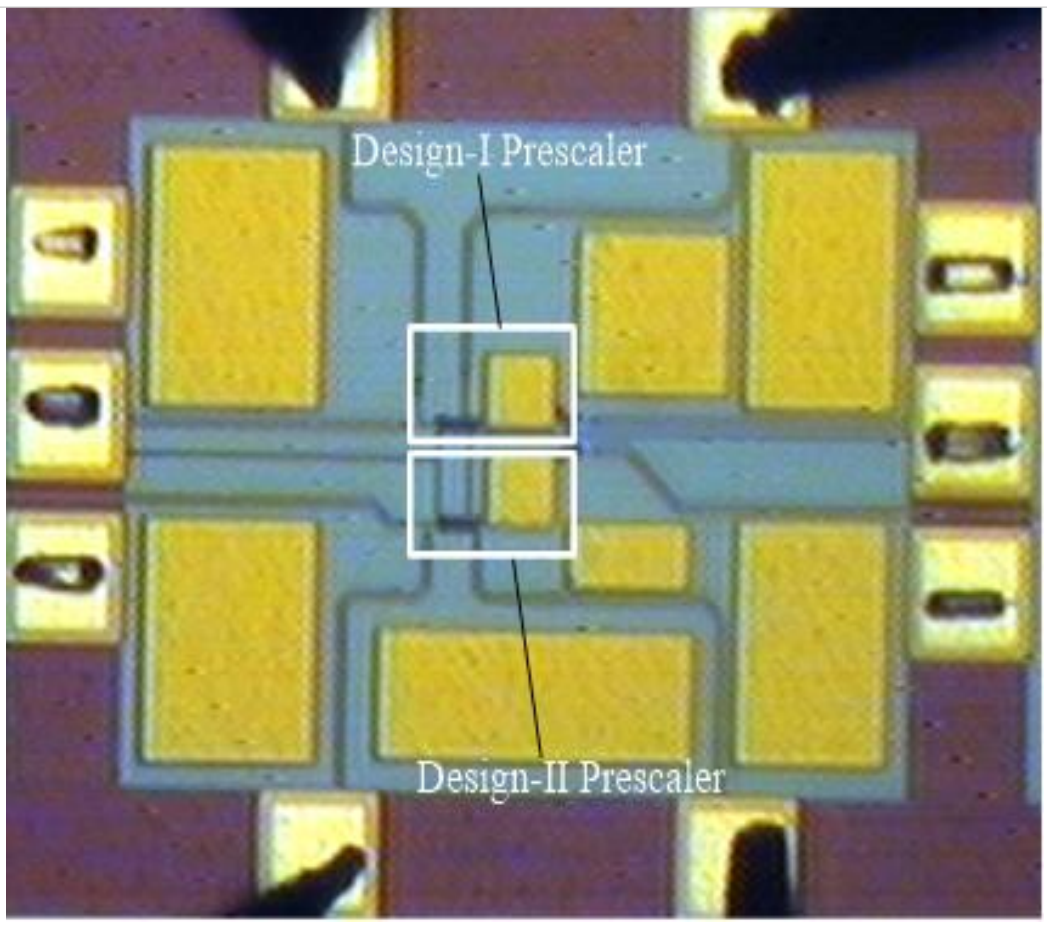


Photo Credit: Javier G. Fernandez, Joel Yang, SUTD

Contact Principal Investigators Associate Professor Joel Yang at joel_yang@sutd.edu.sg, and
Assistant Professor Javier G. Fernandez at javier.fernandez@sutd.edu.sg

CogniVision:

Energy-autonomous always-on cognitive and attentive cameras for distributed real-time vision with milliwatt power consumption



Picture Credit: Yeo Kiat Seng, SUTD

$1.6M *NRF-CRP grant to study energy-autonomous always-on cognitive and attentive cameras for distributed real-time vision with milliwatt power consumption.*

Professor Yeo Kiat Seng, Engineering Product Development Pillar

The current deep-submicron CMOS processes continue to use conductive silicon substrates predominantly for latch-up immunity under tighter design rules. However, integrated inductors, transistors and circuit interconnects fabricated on such lossy substrate suffer from undesirable energy dissipation in terms of capacitive and magnetic losses. The high resistive loss of aluminum and copper metal lines at GHz frequency range not only further degrade the performance of the inductors but introduces more design difficulties as circuit designers and engineers need to carefully consider the effects of the circuit interconnects at GHz. In addition, existing device models cannot ensure good accuracy and continuity of current noise power spectral density in moderate- and weak-inversion (sub-threshold) regimes. Also, at GHz frequency, the induced-gate noise in MOSFETs becomes more prominent under sub-threshold condition. RF circuits and systems fabricated in such an environment are usually less reliable. This is because the current commercial Electronic Design Automation (EDA) tools are unable to accurately predict subtrate-induced noise at GHz range.

The research team proposed to use a standard sub-micrometer RF CMOS technology for our design and fabrication. Original, bold and practical circuit design approaches will be employed to achieve a power consumption of 350µW for the RF transceiver operating at 2.4GHz ISM (Industrial, Scientific and Medical) band, which is at least 100 times less than that of a conventional RF transceiver.

To potentially reduce the receiver power consumption of conventional wireless receivers, and the development of a high performance radio chip to operate in a low power supply voltage environment. The research team has successfully designed and verified a new low-power high-speed TSPC 2/3 prescaler. When compared with existing architectures, the proposed design is capable of achieving a power consumption reduction of at least 7 times while operating at a high frequency of 4.5GHz.

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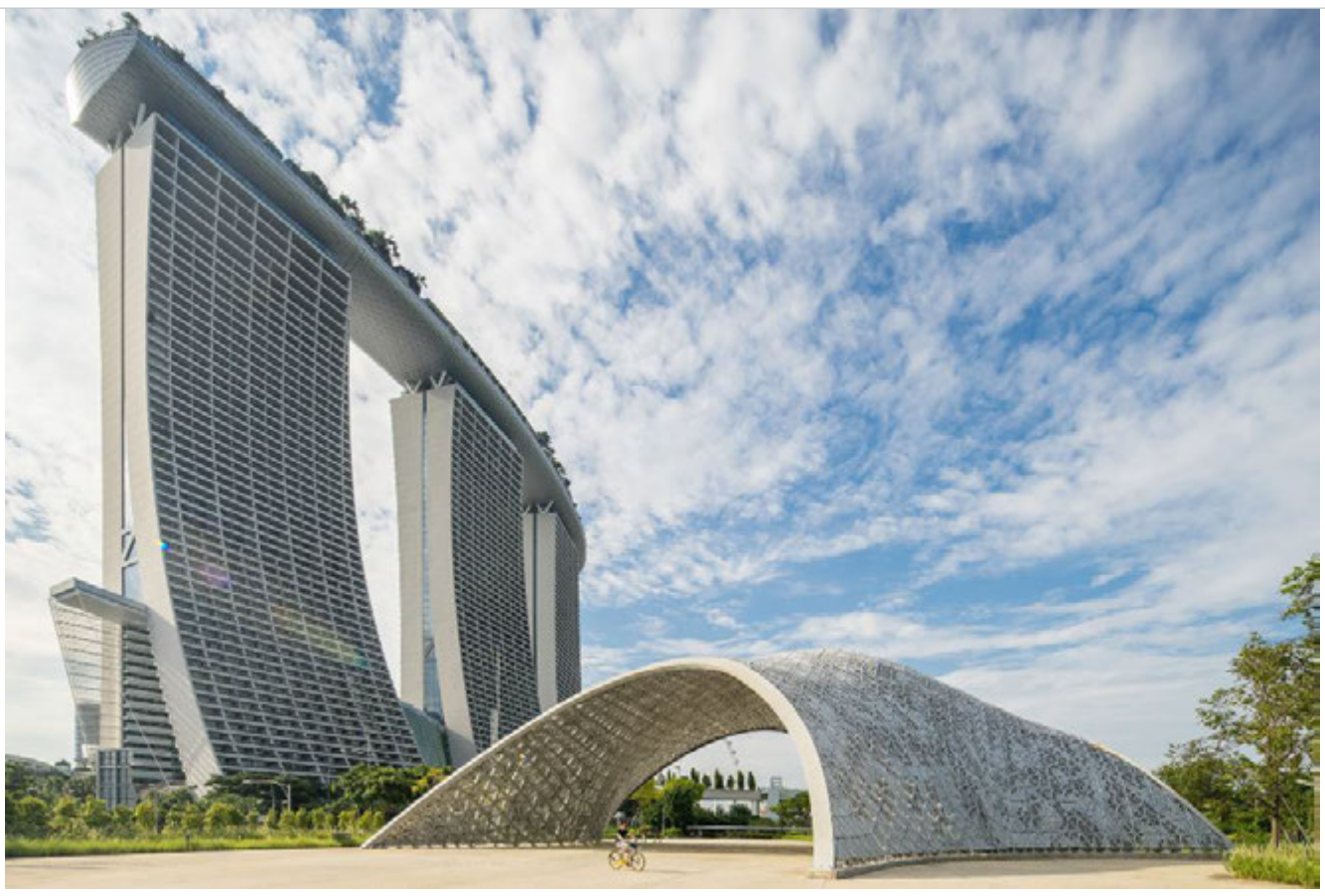
The Future of Us Pavilion receives President*s Design Award 2018



The Future of Us Pavilion as a permanent Singapore landmark, view from south. Photo Credit: Koh Sze Kiat / Oddinary Studios

Why should buildings still be rectangular in shape? This is a question that The Future of Us Pavilion elegantly poses to visitors entering the Gardens by the Bay. The free-form structure—spanning almost 50-metres wide and 16-metres tall—is not just a shimmering entrance into the gardens but a glimpse of what the future of architecture could be.

Professor Thomas Schroepfer, Architecture and Sustainable Design Pillar

The Future of Us Pavilion by Advanced Architecture Laboratory (AAL)

The Future of Us Pavilion received the President*s Design Award (Design of the Year) 2018. It was originally built to house The Future of Us exhibition to commemorate Singapore's golden jubilee in 2015. The pavilion is an extension of an investigation in 2013 that started from a Singapore Institute of Architects ideas competition that focused on parametric design, where AAL has won first prize.

In 2017, the Pavilion became a permanent landmark in the Gardens by the Bay. Renamed "The Silver Pavilion", it plays host to important public festivals and events and has become an important public asset that contributes to advancing Singapore community and culture.

The Future of Us Pavilion is just one possibility from a suite of digital tools the designers created. It demonstrates the potential when disciplinary barriers between architecture, engineering and construction are broken down and information flows seamlessly from one to another. What emerges is a way of design and construction that literally thinks out of the box.

Photo Credit: Thomas Schroepfer

Photo Credit: Fahrul Azmi / Shutterstock

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Additive manufacturing with natural composites

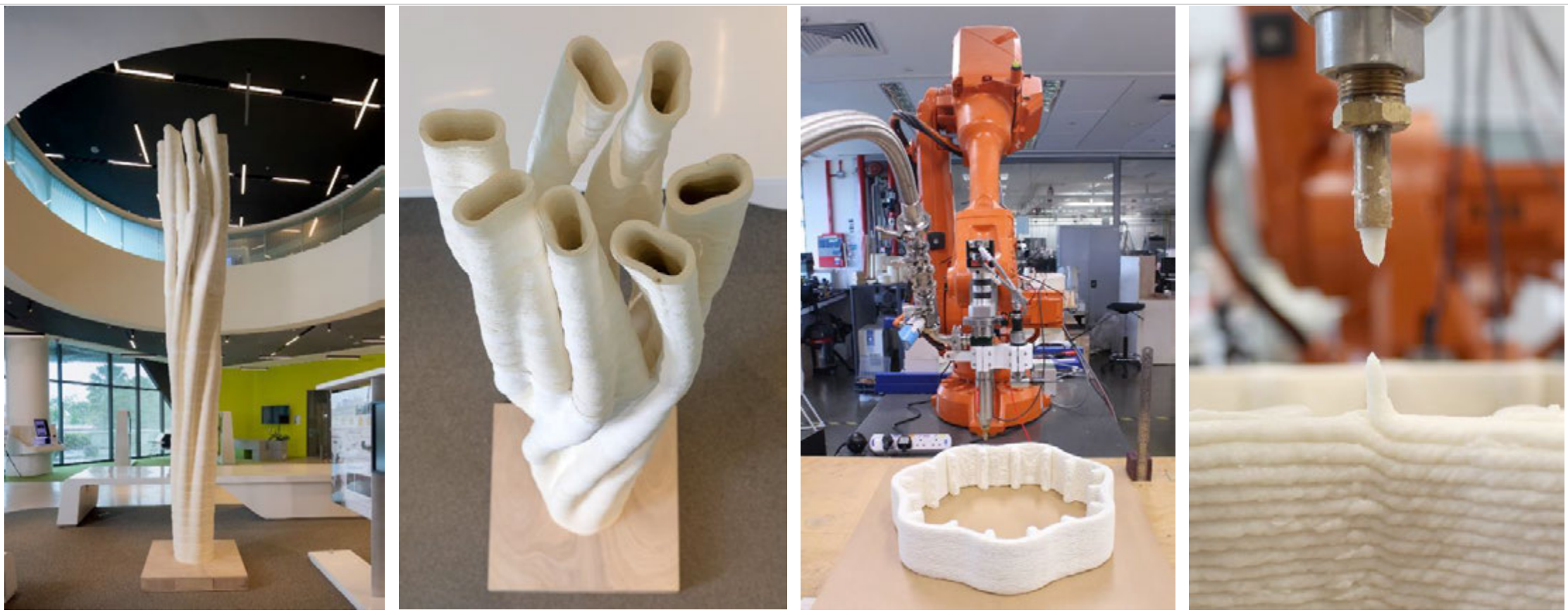

Photo Credit: Javier G. Fernandez, Stylianos Dritsas, SUTD

Assistant Professor Javier G. Fernandez, Engineering Product Development Pillar
Assistant Professor Stylianos Dritsas, Architecture and Sustainable Design Pillar

Cellulose is the most abundant and broadly distributed organic compound and industrial by-product on Earth. However, despite decades of extensive research, the bottom-up use of cellulose to fabricate 3D objects is still plagued with problems that restrict its practical applications: derivatives with vast polluting effects, use in combination with plastics, lack of scalability and high production cost. Here the researchers demonstrate the general use of cellulose to manufacture large 3D objects.

Their approach diverges from the common association of cellulose with green plants and it is inspired by the wall of the fungus-like oomycetes, which is reproduced introducing small amounts of chitin between cellulose fibers. The resulting fungal-like adhesive material(s) (FLAM) are strong, lightweight and inexpensive, and can be molded or processed using woodworking techniques. They believe large-scale additive manufacture with ubiquitous biological polymers will be the catalyst for the transition to environmentally benign and circular manufacturing models.

purmundus challenge 2018 innovation prize

IDA DESIGN AWARDS 2018 Honorable Mention

ASIA DESIGN PRIZE 2019
dritsas javier
TITLE Sustainable Design
COUNTRY Singapore
AFFILIATION SUTD
FINALIST

SINGAPORE GOOD DESIGN 2018

SINGAPORE GOOD DESIGN 2019

TOP 100 - READ ARTICLES - 2018 OFFICIAL AUTHOR SCIENTIFIC REPORTS

Silver A' Design Award Winner in Sustainable Products 2019

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More information can be found here

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New jobs, new directions:
The impact of leveraging AI in the music business

Photo Credit: Dorien Herremans, SUTD

Over the last few years, there's been a steady growth in revenue from digital music. In just six years, revenue from music streaming moved from zero to 40 percent of the overall global recorded music industry revenues, according to a report by IFPI. With revenues to the tune of 11.2 billion dollars a year, the digital model is only set to grow. So "is there still room for a traditional record company?"

Assistant Professor Dorien Herremans, Information Systems Technology and Design Pillar

In a session at TechHR 2019 Singapore, Dorien Herremans from ISTD shared insights from emerging research about how artificial intelligence technologies are changing the music business. Traditional recording companies are already making a pivot, says Dorien Herremans, an Assistant Professor at SUTD. She notes that a number of companies now employ big teams of software engineers, not just to work with streaming music sites, they also need to be able to protect their MP3 and therefore need experts in cyber security. And AI is offering new and interesting possibilities in generating and disbursing music itself. Dorien spoke about three areas where the use of AI is being studied.

Music recommendation

AI based algorithms leverage genre preferences, and social media profiles of the user to recommend new music. There's a strong correlation between music and emotion, says Dorien. When listening to music, it can typically easily evoke certain emotions. Using an annotated emotions dataset, we can train AI models to help us make music recommendations based of desired emotional states.

Hit song prediction

In the music business, there is a lot riding on the success of hit singles. The cost of breaking a new artist is estimated to be around $500,000 to $2 million USD. A study of the datasets on dance hit songs from 1985 to 2013, revealed that music preferences change. For instance, over time, the songs have been getting shorter, and louder. It was Dorien who did this study. During her PhD study, she used data to create data science models to predict if a particular song would top the charts. The model, according to Dorien, correctly identified hit songs with 80 percent accuracy for dance music.

Creating music

A third area where AI is being leveraged is to create music itself. "Music is more than a sum of its parts" Dorien says, explaining that generating music is hard. There are two main problems: 1) Music and emotion are strongly related. Computers aren't good at feeling emotion; and 2) When we like a song, it's usually something that sticks to our mind. Computers aren't equipped to deal with long term structures and often rely on song templates. Nevertheless, a handful of start-ups are already offering AI algorithms that produce simple background music.

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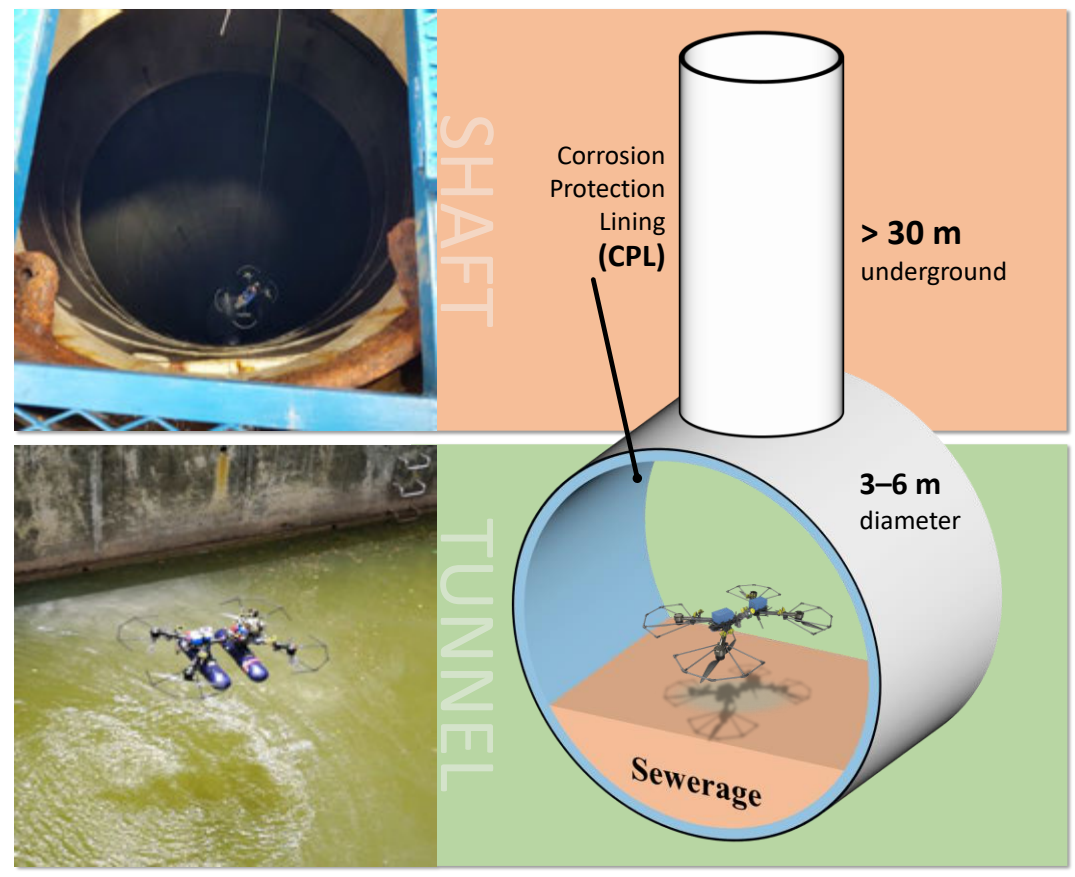
A smart Unmanned Aerial Vehicle (UAV) based imaging system for inspection of deep hazardous tunnels

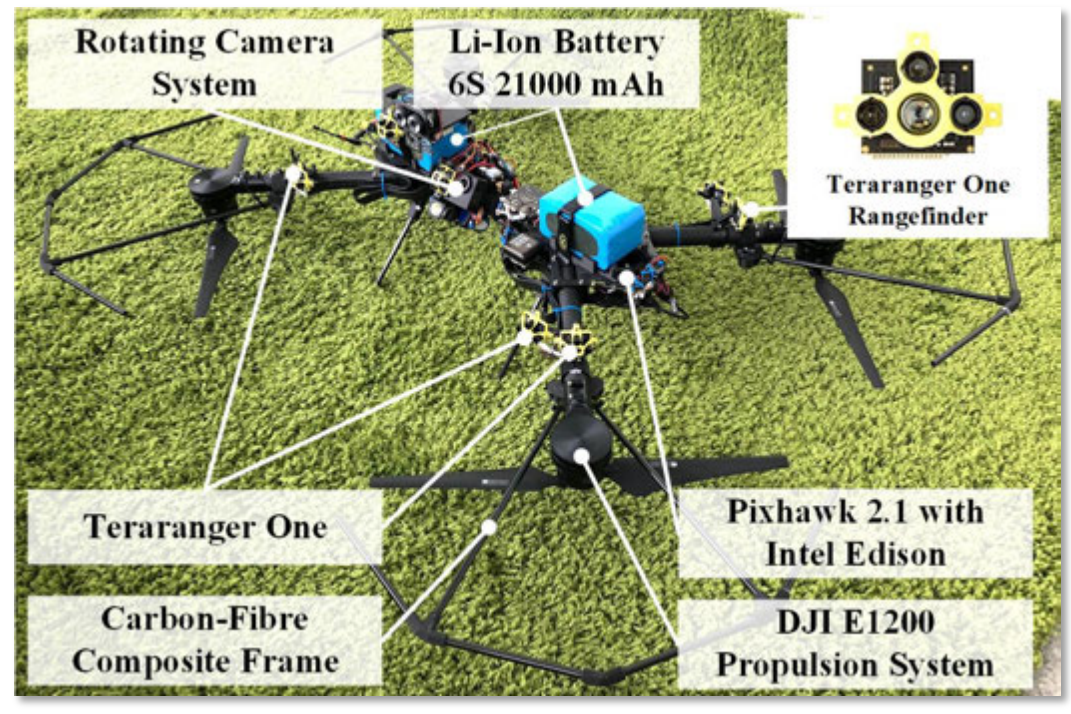
Associate Professor Foong Shaohui,
Engineering Product Development Pillar

The Deep Tunnel Sewerage System (DTSS) in Singapore consist of a 48 km long main tunnel that is located more than 30 m underground. Periodic inspections are critical for monitoring the physical condition the Corrosion Protection Lining (CPL), which protects the inner surface of the tunnel, and the structural integrity of the tunnel. Aerial robots are ideal platforms for automated inspections of the DTSS. Its aerial locomotion allows access to the main tunnel via the vertical access shaft without additional hoist and winch. It is also less affected by the presence of sewerage in a fully operational DTSS. However, such inspection mission demands aerial robots with extended endurance which existing platforms fall short.



(Bottom Left) SWIRL autonomously navigating the Eu Tong Sen Canal tunnel (Bottom) and (Top Left) a DTSS Offset Shaft. (Right) Illustration of the DTSS.

This work presents the design optimization and localization with a sparse range-based sensor array. The optimization focuses on deriving an optimized sensor layout for navigation in right-rectangular prism tunnels and cylindrical shafts. The field of view of the camera system and the mechanical layout of the robot are conceived as constraints to the optimization. The optimized sensor configuration solved using a genetic algorithm performed on average 21 times better than configurations placed heuristically. The result was implemented on SWIRL: Surveyor With Intelligent Rotating Lens. The proposed localization approach with sparse sensing results in at least four-fold reduction in the weight and eight-fold reduction power consumption of the sensing system compared to existing ones. SWIRL was autonomously flown in a series of experiments, consisting of flights in tunnels and shaft both in indoor mock-up and field environment. Lastly, in an endurance test, SWIRL achieved over 35 mins of autonomous flights, making extended aerial robot navigation and inspection of deep hazardous tunnels possible.



SWIRL with Unique 360-degree Rotary Camera System.

Key outcomes from the initiatives are the successful deployment of the Autonomous inspection and experiential trials at the Deep Tunnel Sewerage System (DTSS), and development of a Novel bespoke autonomous aerial inspection platform capable of operating in hazardous and enclosed environments where GPS are unavailable.

Experimental Results

Experimental Site	rms error (m)	max error (m)
Mock-up Tunnel	0.1	0.3
Eu Tong Sen Canal	**0.13**	**0.41**
Mock-up Shaft	0.11	0.32
DTSS Shaft B3	**0.53**	**1.44**

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More information can be found here

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Smart Robotics

Photo Credit: ST Photos: Chong Jun Liang

Autonomous Cleaning Robots

Assistant Professor Mohan Elara, Engineering Product Development Pillar

The Straits Times reported about a pair of robot cleaners from LionsBot International, a joint venture between EPD Assistant Prof Mohan Elara and his partners, that will be working at National Gallery Singapore and Jewel Changi Airport. *(Straits Times, 23 Apr 2019, First pair of robot cleaners report for work at National Gallery, Jewel Changi Airport).* LionsBot is an example of how SUTD can be a catalyst in transforming local Small and Medium-sized Enterprises (SMEs) into global manufacturing product companies.

Created by local manufacturer LionsBot International, a pair of similar-looking robots have started scrubbing floors at the National Gallery Singapore and collecting garbage at the newly opened Jewel Changi Airport. These are the first two of its 100 fully autonomous cleaning robots to be rolled out by the end of the year, making it a pioneer in mass producing such machines here as more firms look into automating cleaning. The company already has an order for 100 robots to be rented out to two local cleaning contractors. As the cleaning industry will be affected by the shrinking workforce, the emerging of autonomous cleaning robot represents an opportunity for the sector to reinvent itself.

Soft and Hybrid Robotics

Assistant Professor Pablo Valdivia , Engineering Product Development Pillar

Traditional robotic hardware is discrete, stiff, and not well suited for harsh environments found in various environmental, industrial, and medical applications. Soft Robotics is an alternative to traditional robotics that uses materials science and chemistry to enable new hardware paradigms which are more robust and safer for interactions with delicate environments (e.g. humans). Thanks to new digital fabrication approaches and material synthesis, soft robotic hardware has a high potential for functionalization. The field of soft robotics has opened up new possibilities to solve unmet industry needs. Advances in digital design and fabrication techniques are key for its further development.

The targeted key industry applications will include hybrid robotic grippers for fine manipulation tasks in remanufacturing and logistics (pick & place, packaging), automated food assembly for in-flight catering, and underwater vehicles for inspection and monitoring of harsh environments and around delicate structures.

Photo Credit: Pablo Valdivia , SUTD

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More information can be found here

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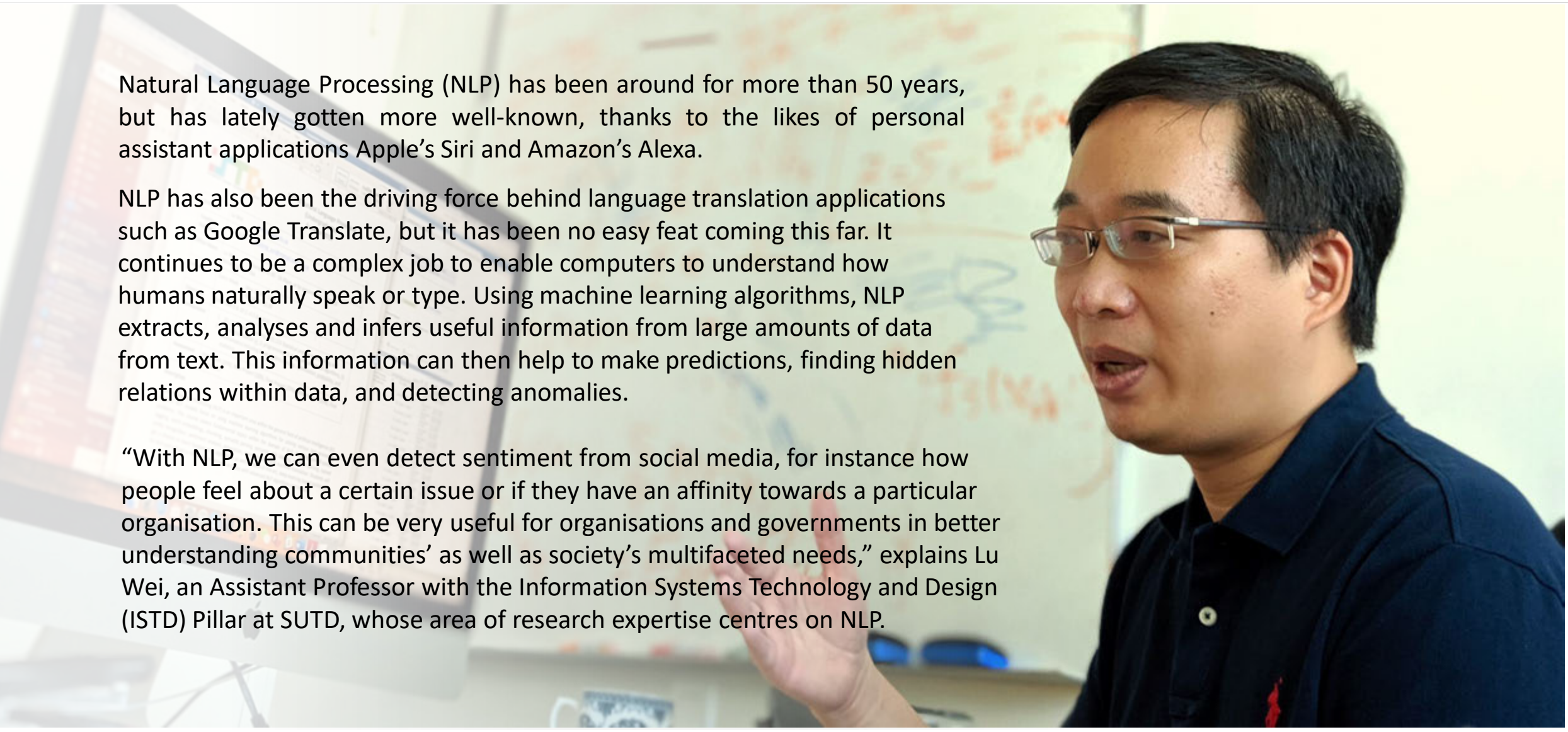
Taking Natural Language Processing to greater heights

Article by: Jessica Sasayiah



Natural Language Processing (NLP) has been around for more than 50 years, but has lately gotten more well-known, thanks to the likes of personal assistant applications Apple's Siri and Amazon's Alexa.

NLP has also been the driving force behind language translation applications such as Google Translate, but it has been no easy feat coming this far. It continues to be a complex job to enable computers to understand how humans naturally speak or type. Using machine learning algorithms, NLP extracts, analyses and infers useful information from large amounts of data from text. This information can then help to make predictions, finding hidden relations within data, and detecting anomalies.

"With NLP, we can even detect sentiment from social media, for instance how people feel about a certain issue or if they have an affinity towards a particular organisation. This can be very useful for organisations and governments in better understanding communities' as well as society's multifaceted needs," explains Lu Wei, an Assistant Professor with the Information Systems Technology and Design (ISTD) Pillar at SUTD, whose area of research expertise centres on NLP.

Tackling NLP Research Problems with a Unified Approach

Lu Wei, a two-time champion of the National Mathematical Olympiad Competition in China, has led several research initiatives into developing more efficient principled mathematical and algorithmic solutions to various fundamental NLP problems. Having spent years trying to come up with a unified approach to solving such NLP tasks, Lu Wei's idea of hypergraphs sparked rather unexpectedly at a library one afternoon in 2014.

"I believe that an inquisitive mind-set, passion and patience help us researchers to get through the challenges that come with the unpredictable process of research," Lu Wei shares while professing his deep appreciation for maths, machine learning and language.

The unified approach to natural language processing enabled the research team led by Lu Wei to build various novel algorithms for a variety of applications, including information extraction, sentiment analysis and semantic parsing. This includes his research on the segmental hypergraph model which was published in the Proceedings of the Empirical Methods in Natural Language Processing (EMNLP) conference 2018, one of the most highly regarded publications devoted exclusively to the computational and mathematical properties of language and the design and analysis of NLP algorithms and models.

"In building a natural language understanding system, it is very important to identify the basic semantic words and phrases in a body of text called entities. This is usually done through a fundamental task known as Named Entity Recognition, or NER. However, as entities may overlap with one another, it can be difficult to accurately extract all the entities due to the extensive list of possible combinations. So we designed a neural segmental hypergraph model which is able to extract all entities, including those that may exhibit non-conventional patterns, providing a much more efficient, yet robust solution," says Lu Wei. He is confident of the model's potential which can possibly be expanded for use in the biomedical domain as it requires a similar sequence modelling task.

Contact Assistant Professor Lu Wei at wei_lu@sutd.edu.sg, and Jessica Sasayiah at jessica_sasayiah@sutd.edu.sg

Collaborating for Greater Impact

Lu Wei led a research team and worked with Alibaba, a Chinese multi-national conglomerate that specialises in e-commerce, to design several models around the theme of Chinese natural language processing.

In one of the projects, the team focused on the task of Chinese address parsing. Unlike English addresses, Chinese addresses are typically written in the form of a consecutive sequence of Chinese characters while probably intermixed with digits and English letters, resulting in incomplete or inaccurate information before analysis.

The Chinese address parsing model is able to encode the regular patterns among chunks that appear at the beginning of a Chinese address, while flexibly capturing the irregular patterns and rich dependencies among the chunks of different types that appear towards the end of the address. This is achieved by designing a novel structured representation integrating both a linear structure and a latent-variable tree structure. For their outstanding research, their paper was accepted at the Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT 2019), known to be one of the top conferences in the NLP field.

Separately, Lu Wei and his research team collaborated with Alibaba again on tackling the fundamental problem of incomplete annotation for named entity recognition. In the research paper, they identified limitations with the assumptions made by various previous approaches and proposed a principled solution to better tackle the problem. This research paper was also accepted by NAACL-HLT 2019.

Achieving Research Excellence through Teamwork

Another well-received paper which was published at EMNLP 2018 was awarded to Lu Wei and his student for their combined effort in building a dependency-based hybrid tree model for semantic parsing – one of the fundamental tasks within NLP. The resulting model allows for a new approach for mapping a sentence into its semantic representation with a principled, efficient algorithm which is shown to be more robust and is able to work across different languages.

Additionally, in a recent work published in 2019, Lu Wei and his research team proposed a new sequence labelling approach to solving math word problems – a long-standing artificial intelligence task. The research is the first of its kind that effectively tackles the problem from a sequence labelling perspective. It was published at the 57th Annual Meeting of the Association for Computational Linguistics (ACL), another top conference in the field of natural language processing.

All these models were developed based on the same hypergraph framework concept that Lu Wei developed.

“I feel very fortunate to work in a conducive and supportive environment. I am surrounded by colleagues, students and industry partners who are aligned closely with our vision to advance the field of NLP in Singapore and beyond. The synergy that such collaborations brings about is nothing short of powerful, allowing us to scratch beyond the surface so that we can form deeper insights into complex areas of research. I hope to continue cultivating this culture we have here, and further grow our team of NLP experts at SUTD,” shares Lu Wei.

About Assistant Professor Lu Wei

Lu Wei is an Assistant Professor with the Information Systems Technology and Design (ISTD) Pillar at the Singapore University of Technology and Design (SUTD). He also leads StatNLP at SUTD, a research group which focuses on problems in natural language processing (NLP).

Lu Wei has published research on designing mathematical models and efficient machine learning algorithms for finding novel solutions to fundamental problems within natural language processing (NLP). His current research centres around identifying a unified approach to solving a variety of diverse NLP problems which are essentially structured prediction problems. He served as the general chair of the inaugural Singapore Symposium on NLP in 2018, which successfully received over 600 registered participants from industry, government and academia. Prior to joining SUTD, he worked as a postdoctoral research associate at the University of Illinois at Urbana-Champaign and was a PhD student at the Singapore-MIT Alliance of the National University of Singapore.

Lu Wei received his Bachelor’s degree (1st class) from the School of Computing, National University of Singapore where he also subsequently received the prestigious Dean’s Graduate Research Excellence Award and the President’s Fellowship during his PhD. He has received several other awards, including Best Paper Award at the 2011 Conference on Empirical Methods in Natural Language Processing (EMNLP), one of the best conferences in the field of natural language processing.

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Our Research Talent

Global Highly Cited Researchers 2018 List

For the third consecutive year, Associate Professor Tony Quek (ISTD Pillar) has been listed in the **Global Highly Cited Researchers list for 2018**. Now in its fifth year, the list by **Clarivate Analytics** identifies influential researchers as determined by their peers around the globe, having consistently won recognition in the form of high citation counts with multiple papers ranking in the top 1% by citations for their field and year. Data for this citation analysis is taken from the Web of Science, which is the world's most trusted and largest publisher-neutral citation index.

40 Under 40, Prestige Magazine, & Nature Research Awards for Inspiring Science 2018

Associate Professor Dawn Tan (EPD Pillar) was featured in the **40 Under 40, Prestige Magazine, 2018** (*Published in Prestige August 2018 issue).*
Awarded by Prestige magazine to Singapore-based leaders, creative and change makers 2018's spotlight on Prestige Magazine's eighth annual 40 Under 40 list is titled **The Vanguards**.

Dawn is also selected as one of the top 10 finalist in Nature Research Awards for Inspiring Science 2018 and the only one from Asia).

Nanotechnology Medal 2018

Associate Professor Yang Hui Ying (EPD Pillar) was awarded the prestigious **Nanotechnology Medal 2018** by Institute of Physics Singapore (IPS). The IPS Awards and Medals are given to local physicists who have made significant contributions in the field of physics. Hui Ying's research has contributed to develop effective solutions by advancing the current science and technology to address the worldwide energy and water scarcity and offer opportunities with economic and social benefits to society.

Our Research Talent

2018 MRS iMatSci Innovator Award

Innovation: A Design for a Better Type of Memory.

Assistant Professor Desmond Loke (Science and Math Cluster) and his team received the 2018 Materials Research Society (MRS) iMatSci Innovator award for their work on the design for a new type of phase-change memory device which is as fast as RAM and packs even more storage capacity than flash.

The American Society of Mechanical Engineers (ASME) Best Paper Award

The robotics team at SUTD Temasek Lab, led by Associate Professor Soh Gim Song (EPD Pillar) received Mechanisms and Robotics Best Paper Award at the ASME 2018 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE), held in Quebec, Canada.

Top 100 Materials Science Papers on Scientific Reports in 2018

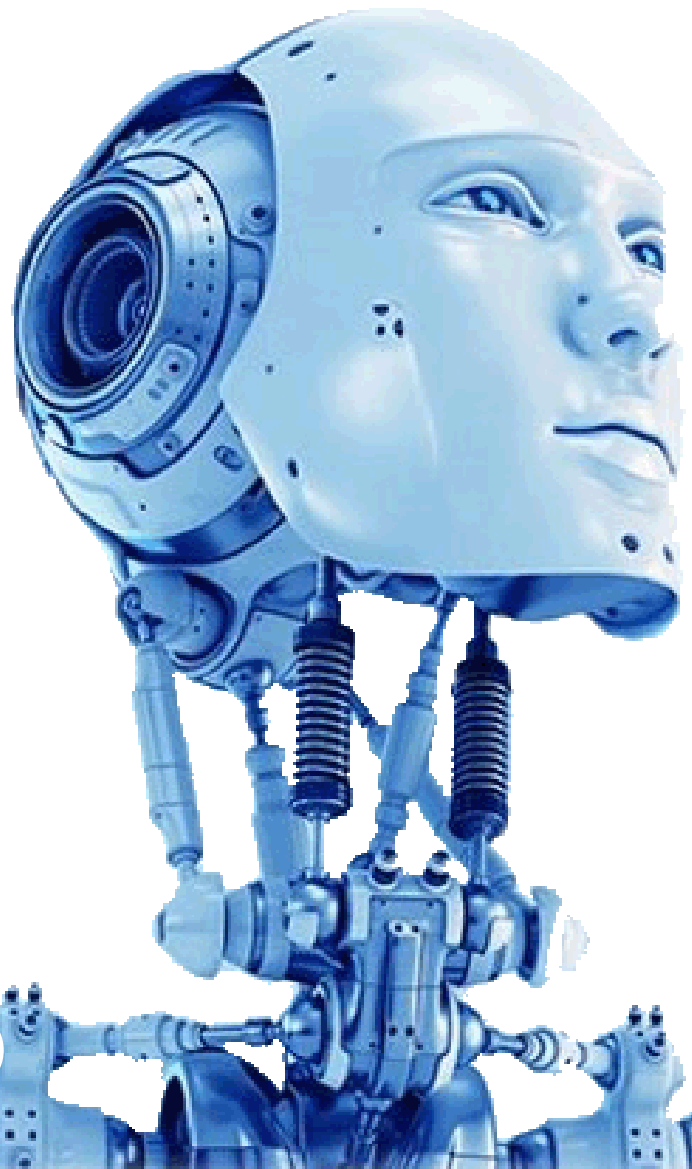
The research paper *Large-scale additive manufacturing with bioinspired cellulosic materials*, by a team of SUTD professors and researchers, has been placed as one of the top 100 read materials science papers for Scientific Reports in 2018.

Co-led by Assistant Professor Javier G. Fernandez (EPD Pillar) and Assistant Professor Stylianos Dritsas (ASD Pillar), the research demonstrated the use of cellulose to sustainably manufacture/fabricate large 3D objects. Inspired by the wall of the fungus-like oomycetes, the resulting fungal-like adhesive material(s) (FLAM) are strong, lightweight and inexpensive, and can be molded or processed using woodworking techniques.

Research Facilities and Infrastructure

Makerspace – Prototyping and Fabrication Facility

A newly setup facility at the Entrepreneurship Centre support researchers and start-ups for fabricating their Proof-of-Concept prototypes. This one-stop prototype and fabrication facility improves the speed and efficiency of prototyping activity. It is also part of the new Entrepreneurship office. The equipment includes mainly 3D printers, PCB prototyping equipment, ME/EE workstations etc.



Supercomputing @ SUTD

Our Supercomputing facilities provides access to different types of in house computing infrastructures to support the needs of SUTD faculty and researches in wide range of complex computations. These include High performance cluster for general computing, cloud computing infrastructure that supports Big data research and GPU based clusters for the needs of Artificial Intelligence community. For more information, please visit https://computing.sutd.edu.sg.

- Titan High Performance Cluster
- *Hermes Cloud* Computing
- Athena & Dev Boxes
  GPU Based Servers

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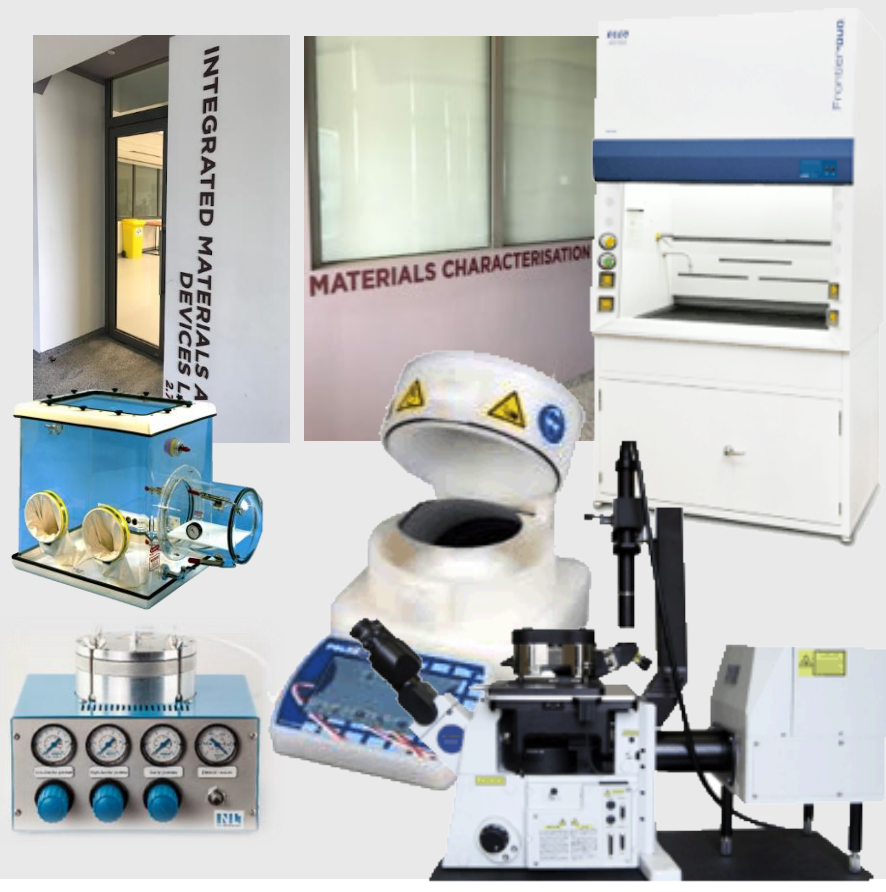
Research Facilities and Infrastructure

Materials Laboratories

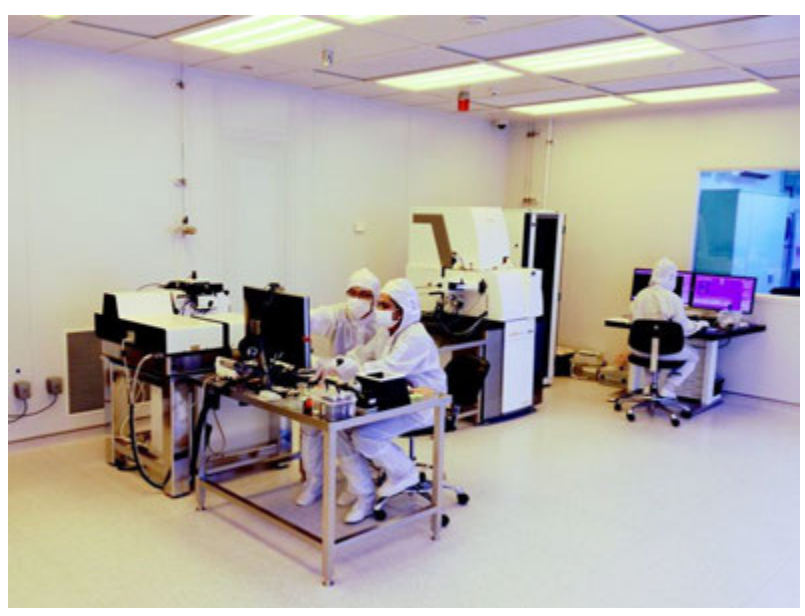
Materials Lab focuses on research works in Material Science, Micro and Nanotechnology. It allows synthesis and modification research of nanomaterials and nanocomposites using solution and non solution based processing methods. Researcher are able to tailor interfacial properties of nanomaterials and composites and control material properties using tailored advanced microstructures. Besides, it also facilitate development of microstructure-property in performance relationships for multiscale composite systems. Some of the key applications includes Sensors, Photo responsive devices, Contrast agents and etc.



SUTD Cleanroom

Established in Aug 2015, the SUTD Cleanroom is designed to facilitate the complete semiconductor process, nanofabrication and precision machining for both undergraduate and graduate students and research fellows. The Class 1000 Cleanroom is a safe work environment that has a fully automated building management system (BMS) and innovative state-of-art facilities.

The Cleanroom has equipment with capabilities and infrastructure for various nano-engineering processes like electron beam evaporation, electron beam lithography, reactive ion etching, nano imprinting lithography, nanoscribe, profilers, microscopes and various unique lithography techniques.



Bio-Engineering & Allied Technologies Laboratory

The Bio-Engineering & Allied Technologies Laboratory (BEATs Lab) focuses on Host-Parasite Interaction Research Group at SUTD using malaria parasite Plasmodium as the model system. Main research focus is the identification and characterization of complex events that the parasites adopt to manipulate human cells during intraerythrocytic development and subsequently exploring opportunities to target them. Others research topics include multiphase micro/nanofluidics, biomaterials formation, drug delivery, BioMEMS and Lab-on-a-chip and development of medical and diagnostic devices.

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