

FUSION

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TECHNOLOGY AND DESIGN



SINGAPORE UNIVERSITY OF
TECHNOLOGY AND DESIGN

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ARTIST'S IMPRESSION OF CAPITALAND TAN TAY
HOPE KINDERGARTEN

NEW DESIGN AND AI DEGREE PROGRAMME



Starting academic year 2020, SUTD will offer a new undergraduate degree programme in Design and Artificial Intelligence (DAI). The first of its kind in Singapore, the new programme aims to nurture a new breed of talents with the ability to combine expertise in design innovation with AI technologies to improve lives, grow the economy and sustain the world. Students who take up DAI will be exposed to areas of design such as user interface/user experience, product, systems, built environment and data-driven design, learning to use AI technologies and algorithms to create better design and applications.

The 3.5-year DAI programme will be like other SUTD undergraduate degree programmes where students take a

common foundation curriculum in the first year (first 3 terms), before selecting their majors in the second year.

Graduates from this Bachelor of Science programme will be prepared for jobs such as AI solution architects, data scientists and data visualisation specialists, among many others, in industries such as urban planning, product design, service industries, deep tech companies like telecommunications, etc.

SUTD President, Professor Chong Tow Chong said: “The recent announcements from Deputy Prime Minister Heng Swee Keat on the next steps in Singapore’s Smart Nation journey underscores the importance of AI and its role in bringing about social and economic benefits. Hence, SUTD’s new DAI degree programme is timely and appropriate. The main goal of DAI is to equip students with the ability to create human-centred design using data analysis and machine learning, which is AI-driven. We are essentially nurturing the next generation of leaders and talents who will be able to harness AI technologies to better the world by design.”

Industry partners have also weighed in on the importance of DAI. “The programme will equip the students in design discipline with the much-needed complementary AI skills for them to differentiate themselves further,” said Dr Terence Hung, Chief of Future Intelligence Technologies, Rolls Royce.

SUTD PARTNERS WITH SP TO GIVE POLYTECHNIC STUDENTS EARLY EXPOSURE TO UNIVERSITY-LEVEL MODULES

In January, SUTD announced a partnership with Singapore Polytechnic (SP) where students from SP’s School of Electrical & Electronic Engineering will have the opportunity to take up modules taught by SUTD. These university-level modules will count towards the students’ graduation requirements and be offered in lieu of the electives offered by SP. The credits may also be recognised if they choose to pursue a degree with SUTD.

In addition, SP and SUTD will be introducing the SP-SUTD Pathway Programme (PP) that will allow up to 20 students to complete the regular SP curriculum in about five semesters, compared to the usual six semesters. Students on the SP-SUTD PP will have the opportunity to take up SUTD modules in their final semester at SP, alongside SUTD students in their Freshmore year. This will allow SP-SUTD PP students who choose to progress to SUTD after graduation, to complete their SUTD degree in a shorter period of time.

SP’s Senior Director (Engineering Cluster), Mr Loh Yew Chiong said: “The collaboration with SUTD will offer SP students who are interested in pursuing an engineering degree an opportunity to be exposed to university-level content. The enhancements to SP’s academic offerings will strengthen the education experience for our students, and stand them in good stead in their careers. We will consider rolling out

similar programmes for other SP courses in the near future if student interest is high and student outcomes are positive.”

Professor Pey Kin Leong, SUTD Associate Provost for undergraduate studies said: “We are pleased to partner with SP to provide more pathways for students to pursue an SUTD education in engineering. This pathway will help SP students graduate earlier with a diploma and bachelor degree, and allow us to groom more technically-grounded leaders and innovators who can help better Singapore and the world by design.”

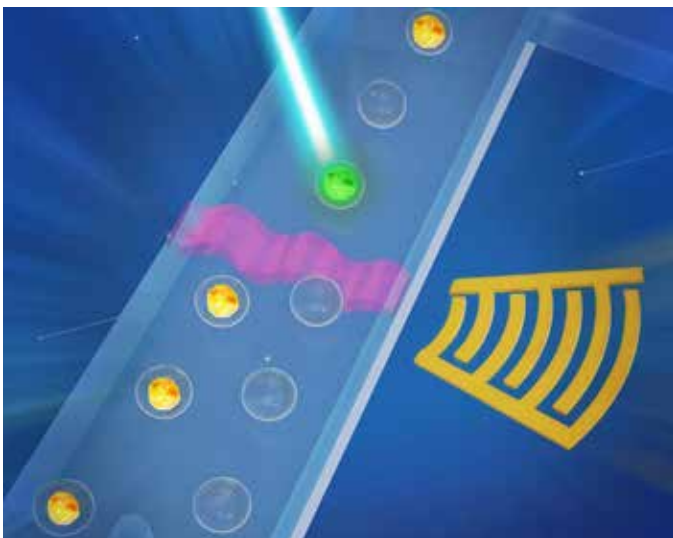


A MICROFLUIDIC DEVICE THAT CAN SORT SINGLE-CELL DROPLETS ACCURATELY

In recent years, rapid progress in the development of single-cell sequencing has provided numerous important insights for understanding the functionality and variation within cell types. Droplet-based microfluidic systems have emerged as a very powerful and effective tool to isolate and analyse biological cells at the single-cell level. However, existing droplet generation is a random process that captures cells at a single-cell encapsulation rate of generally lower than 5%. Hence, there is a great need to develop a platform that can isolate single-cell droplets at high yield.

Led by Engineering Product Development Associate Professor Ye Ai, researchers from SUTD have developed a detachable acoustophoretic system for fluorescence-activated sorting at single-droplet level to detect and isolate single-cell encapsulated droplets at high accuracy and yield.

The developed fluorescence-activated droplet sorter (FADS) integrates droplet generation and acoustic sorting into one device with the ability to uniformly produce droplets and accurately sort single-cell droplets with purity higher than 90%. Meanwhile, the detachable system also prevents samples from cross-contamination and keeps the expensive focused interdigitated transducer reusable.



An acoustic FADS system that can achieve accurate isolation of single-cell droplets for high-yield single cell sequencing

Principal investigator, Prof Ai said: “Droplet-based single-cell sequencing is a very powerful tool for studying the cellular heterogeneity in diseased tissues for a variety of biological problems. The FADS that our team has developed is able to encapsulate single-cell droplets and isolate them at 90% accuracy, resolving the low-yield drawback of existing droplet generation systems.”

This work was published in *Analytical Chemistry*, a top-tier journal focused on research in developing original application of analytical methods and results on an important analyte in analytical chemistry. SUTD graduate students, Li Peixian, Ma Zhichao and Zhou Yinning participated in this research project.

STUDENTS DESIGNED YEAR OF THE RAT CHINATOWN STREET LIGHT-UP



Year of the Rat Design Theme – Success

This year, SUTD once again collaborated with the Kreta Ayer-Kim Seng Citizens’ Consultative Committee to design the Chinatown Chinese New Year Street Light-Up.

For the Lunar Year of the Rat, the inspiration behind the design came from three themes – *Success, Celebration and Family*. Under *Success*, the Zodiac race marks the victory of the Rat and its initiation as the first animal into the Zodiac calendar.

Under *Celebration and Family*, a resplendent lantern display of adorable rats dressed in traditional Chinese costumes took over the streets, accompanied by overhanging lanterns in shapes of gold coins, ingots, mandarin oranges, firecrackers, Chinese scrolls, pineapples, Yusheng and red packets to represent prosperity, good fortune and the importance of family reunion.

The spectacular display included a total of 1,388 handcrafted lanterns that illuminated Chinatown. This is the ninth year that the Chinatown Street Light-Up is designed by SUTD students.



Design signifying Celebration & Family

MULTIPLE COLLABORATIONS TO DEVELOP SINGAPORE'S PIPELINE OF TECH TALENTS

SUTD started the year with multiple industry collaborations to address the increasing demand for skilled tech talents. As Singapore journeys towards becoming a Smart Nation, it has become essential for academic institutions to provide relevant training at both the undergraduate and adult learning levels.

SUTD AND ST ENGINEERING SIGN MOU TO ADVANCE WORKPLACE LEARNING IN DESIGN THINKING

SUTD and ST Engineering signed an MOU on 13 January to co-develop courses and programmes to build workforce competencies in human-centric design and innovation as well as research. This MOU is built upon past collaborations between SUTD and ST Engineering which has seen some 400 employees benefit from its design innovation programmes over the last two years.

The fully-sponsored design thinking and innovation courses are expected to benefit up to 1,000 ST Engineering employees, equipping them with design thinking skills to help them approach problem-solving through a user's lens, enabling new perspectives and creativity in developing effective solutions that better address customers' needs.



(L-R) Vincent Chong, President & CEO, ST Engineering and Prof Chong Tow Chong, President of SUTD at the MOU Signing Ceremony

Key areas of cooperation include:

- The development of a three-day course in Maintenance Repair and Overhaul (MRO)-centric design thinking to help employees develop a more holistic approach to problem-solving. This has applications in areas such as Aerospace MRO where design thinking can help to reduce workflow and process complexities which are increasing as a result of automation.
- The development of a tailored 'Innovation by Design' ModularMasters™ (MM) two-year part-time programme that allows ST Engineering employees to subscribe to SUTD's

bite-sized, skills-based modules to meet their workplace learning needs. Employees who complete the MM programme and wish to further their training in design thinking can advance to SUTD's Master of Innovation by Design (IbD) degree programme, where subject credits earned from the MM can be used to offset the credits required for the IbD programme. These programmes are designed to give employees more flexibility and opportunities in learning even as they take on full time work.

Professor Chong Tow Chong, SUTD President said: "Over the past two years, SUTD Academy and the SUTD-MIT International Design Centre's Design Innovation team have delivered Design Innovation training to close to 400 staff from engineering to senior leadership roles. It shows that ST Engineering shares our belief in the effectiveness of design thinking and innovation. With the continued strong support of our industry partners, SUTD is committed to imparting design skills that help workers stay relevant in today's innovation-intensive economy."

Vincent Chong, President & CEO, ST Engineering said: "As businesses retool to adapt to digitalisation and changing business climates, employees too will need to keep pace and continually acquire new skillsets to sharpen their professional edge. Design thinking will augment our work, enabling fresh perspectives and approaches to solving our customers' challenges, ultimately strengthening our competitiveness."

SUTD AND SHOPEE PARTNER TO NURTURE SINGAPORE'S TECH TALENT PIPELINE



(L-R) Prof Chong Tow Chong, President of SUTD and Gang Ye, Group Chief Operating Officer of Sea at the Scholarship Gift Ceremony on 23 January 2020

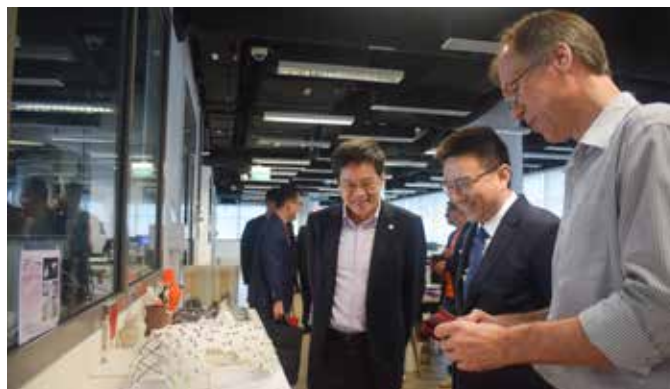
SUTD and Shopee, the e-commerce arm of Sea, joined hands to nurture Singapore's tech talent pipeline in the form of four bond-free scholarships for financially disadvantaged

Singaporean students. The scholarships will be awarded across four years, starting from the Academic Year 2020 intake. Each scholarship will be worth \$15,000 annually. In addition, Shopee and SUTD will organise dialogue sessions to explore more avenues for industry-university collaboration by combining Shopee's industry know-how, regional presence, and ecosystem together with SUTD's educational expertise.

These build on Shopee's ongoing initiatives with SUTD, which include internship programmes, knowledge-sharing sessions, as well as project sponsorships – most recently, Shopee sponsored Team SUTD's participation at the Autonomous Aerial Vehicle Challenge (AAVC) 2020 in Chumphon, Thailand.

Gang Ye, Group Chief Operating Officer of Sea, said: "Shopee is always looking for new ways to better the lives of people – whether it is by building communities, helping entrepreneurs get started, or creating valuable learning opportunities for our leaders of tomorrow. Together with SUTD, we want to do our part to shape the future of Singapore."

SUTD President Prof Chong said: "SUTD is grateful to donors like Shopee, who understand the important role education plays in lifting families out of financially difficult circumstances, and whose generosity help ensure that all deserving students with financial need have equal opportunities to pursue a high quality education."



(L-R) Prof Chong Tow Chong, President of SUTD, Gang Ye, Group Chief Operating Officer of Sea, and Prof David Rosen, Research Director of SUTD Digital Manufacturing and Design (DManD), at the DManD centre

FIRST CORPORATE INNOVATION CHALLENGE BETWEEN SINGAPORE AND MEXICO

In January, 17 SUTD students embarked on a unique challenge and devoted their Independent Activity Period (IAP) to host 17 Mexican students on the first-ever pilot run of the SUTD and Tecnológico de Monterrey (Tec) Winter Programme. The 31-day programme brought together students from both countries to work on real-world problems offered by five Mexican multinationals interested in expanding their operations in the South-east Asian region.

SUTD and Tec students formed five multi-disciplinary teams and assumed the role of consultants for their 'chosen' company. As a team, the students had to harness innovation and technology ideas developed in Singapore to address the multi-faceted problem-statements given by the multinationals. The programme culminated with a live formal presentation session to each of the companies.

A series of targeted activities were scheduled to prepare the students for their assigned challenges. These included faculty-led workshops to stimulate 'Design Thinking', Entrepreneurship talks and site visits to Enterprise Singapore, Changi Airport Group (CAG), Port Singapore Authority (PSA), Urban Redevelopment Authority (URA), Surbana Jurong, to give the students insights and exposure to Singapore's infrastructure.



SUTD & Tec Monterrey's first winter programme

Senior Minister of State for Trade and Industry and Education, Mr Chee Hong Tat, lent his support for the programme and officially welcomed the Mexican students on campus where he elaborated on Singapore's goal to deepen bilateral relations between the two nations. On 23 January, Ambassador to Mexico, H.E. Jennie Chua, and the Mexican Ambassador to Singapore, H.E. Agustin García-López Loaeza, also held a joint 'Meet the students' session at SUTD to learn more about the students' projects.

While developing the solutions and through the many company site visits, the students gained invaluable insights and exposure to real-world business problems. Additionally, weekend social and cultural events to the local tourist attractions provided the opportunity to develop soft skills and a greater appreciation of each other's culture.

This experience reflects how corporate teams in global organisations work today and is very much in line with SUTD's philosophy of nurturing skills and attitudes in students that go beyond the knowledge taught in classrooms.



SMS Chee Hong Tat engaging with the Mexican students on SUTD campus

STUDENTS WIN 'POWER-UP PASIR PANJANG' COMPETITION



(L-R) Nur Fadhilah Bte Nordin, Sally Tan and Lun Ci Min

Two SUTD student teams from the Architecture and Sustainable Design pillar won the 1st and 3rd prize respectively, in the Tertiary category, for the ideas competition 'Power-Up Pasir Panjang', jointly organised by Urban Redevelopment Authority (URA) and the Singapore Land Authority. The objectives of the competition were to explore the future of the district by inviting the public, professionals and students to re-imagine the district for the next 15 to 20 years.

From the overall 79 submissions received for different categories, 10 winners were selected for their originality, creativity and sensitivity to the site's unique context. An exhibition that showcased proposals from the competition was unveiled by Minister for National Development and Second Minister for Finance, Lawrence Wong, at The URA Centre on 13 January.

SUTD'S WINNING SUBMISSIONS

Tertiary Category

1st Prize: Merging Scapes

By Hendriko Teguh Sangkanparan, Nur Fadhilah Bte Nordin, Sally Tan and Lun Ci Min

Sustainability and nature take prominence in this scheme, transforming the district into a nature-centric mixed-use precinct with residential, lifestyle and commercial functions intertwined with parks, water features and recreational facilities. The public spaces proposed thoughtfully consider both ecological restoration and how people interact with the space. To create distinctive recreational experiences, the scheme demonstrates how water could be weaved in throughout the site to revitalise and create a delightful district for all to enjoy.

The jury commended the ingenuity of the scheme where sustainability and nature took prominence to transform the district into a nature-centric mixed-use precinct. The jury was also impressed by the quality of the public spaces that thoughtfully considered both ecological restoration and how people interacted with the space. The scheme demonstrated how water could be weaved in throughout the site to create a delightful district for all to enjoy.



(L-R) Dion Teo Jian Xian, Tan Yuan Ling Rebecca and Ng Su Wen

3rd Prize: South Coast [P]romenade

By Tan Yuan Ling Rebecca, Ng Su Wen, Dion Teo Jian Xian and Chen Rui

The Pasir Panjang district is envisioned as a new residential district that functions as the central hub that serves the future developments in the surrounding area. This scheme presents a bold and exciting idea for a unique waterfront residential enclave that wraps around the site, screening off viaduct and existing electrical substations, while providing cleverly created points of connection. With Power Station A as a transport and community hub, and B as a learning hub for family and lifestyle activities, they serve as the focal points of regeneration, celebrating the history of the place while breathing a new life into the buildings through daily remembrance and utility.

The jury commended the scheme for its bold, exciting and refreshing idea for a unique waterfront residential enclave that wrapped around the site, screening off the viaduct and existing electrical substations, with cleverly created points of connection to the surrounding areas. However, while the mix of uses was sensible, the jury felt that the scale of the residential block could relate more sensitively to the adjacent Labrador Nature Reserve and the waterfront.

SUTD HELPS WITH THE DESIGN AND CONSTRUCTION OF CAPITALAND TAN TAY HOPE KINDERGARTEN

BY ONG ZI CHONG, LOW SI HONG, CHONG KAR WEI AND CHIN KEE TING



The topography morphs into a grand staircase that connects the ground level to the upper level, facilitating overall air circulation throughout the kindergarten

The development of CapitaLand Tan Tay Hope Kindergarten was a collaborative project by CapitaLand Hope Foundation, SUTD, University of Architecture Ho Chi Minh City, Van Lang University, and Ho Chi Minh City University of Technology. The aim was to design and build a kindergarten in Tan Tay, Long An province of Vietnam, about two hours' drive from Ho Chi Minh City. The opportunity allowed us to envision how early childhood education in a rural context could be like.

In January 2019, the Tan Tay Kindergarten project first started out as an SUTD Independent Activity Period (IAP) for Architecture and Sustainable Design (ASD) and Engineering Product Design (EPD) students, where a preliminary site survey was carried out under the mentorship of SUTD Opportunity Lab (O-Lab). It was subsequently translated into an ASD Option Studio led by Associate Professor Chong Keng Hua, where the design of the kindergarten was co-created with the local community, continually refined and handed over to the CapitaLand Vietnam project team in May 2019.



Students presenting their design ideas to the local community

Built with sustainable local materials, the new L-shape school block with six classrooms was designed as an extension of the existing block, topped with a continuous roof form to ensure that the compound would be seamlessly integrated. Double-volume in-between spaces were incorporated for communal and environmental purposes, with the use of local ventilation blocks for western-facing sun shading. A grand staircase served as a bridge from the large courtyard at the ground level to the upper level, and facilitated the overall circulation of the kindergarten. The design was a realisation of our design concept for the pre-school environment, to encourage: Exploration, Expression and Excitement.

In November 2019, the SUTD team was invited back to Tan Tay for an international volunteer expedition that was organised by CapitaLand. This time we completed the finishing touches which included the painting of wall murals, fences and creation of sustainable play equipment. In all, the project was meaningful for all of us as it serves the interests of the local beneficiaries for years to come.



(L-R) Chin Kee Ting, Associate Prof Chong Keng Hua, Ong Zi Chong, Low Si Hong and Chong Kar Wei



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