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THE POTENTIAL OF
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SUTD

SINGAPORE UNIVERSITY OF
TECHNOLOGY AND DESIGN

Established in collaboration with MIT

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PIONEER BATCH OF SUTD GRADUATES WELL RECEIVED BY INDUSTRY

SUTD's first batch of graduates have been well received by the industry, with good overall employment rates and competitive salaries, based on the annual Joint Graduate Employment Survey.

85% of SUTD fresh graduates were employed within six months of completing their final examinations, with the top hiring sectors being the research and development and the infocomm services industries. The survey also revealed that the mean and median gross monthly salaries of SUTD's engineering graduates employed in full-time permanent employment were S\$3,729, and S\$3,600 respectively. In particular, the median gross monthly salary for SUTD's Information Systems Technology and Design graduates was S\$3,950, which is comparatively higher than most of their peers.



SUTD's pioneer batch of graduates.

SUTD President, Professor Thomas Magnanti, said: "We are very pleased that our technology and design-trained pioneer students who have taken a bold step to join a new university with a revolutionary pedagogy have been so well received by the industry. A high percentage of our graduates obtained employment in 22 out of 25 of Singapore's key industries, including banking and finance, aviation and aerospace engineering and infocomm services, to name a few. Employers have also expressed their confidence in them through the very competitive starting remuneration they have received – a strong testament that the multidisciplinary hands-on education they acquired at SUTD is valuable in the workplace. As of 15 March 2016, more than 90% of students have been gainfully employed or are pursuing graduate studies in top institutions around the world. We look forward to SUTD graduates building upon their education to better the world."

THEIR QUEST TO BUILD A BETTER WORLD IS RECOGNISED WITH HIGH STARTING SALARIES*



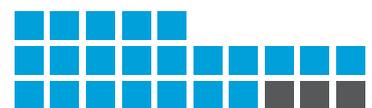
1/4 received job offers after internship



Mean gross monthly salary is \$3,729 with the 75th percentile being \$4,100



Secured jobs in 22 out of 25 of Singapore's key industries



Based on the Economic Development Board's list of Singapore's industries and emerging business sectors.

*Mean gross monthly salary. Based on results from the annual Joint Graduate Employment Survey conducted by SUTD and four other autonomous universities - NUS, NTU, SMU and SIT.



SUTD Engineering Systems and Design graduate, Felicia Choo, who is now working as a management associate at MasterCard said: “The hands-on and collaborative learning pedagogy at SUTD helped prepare me to be work-world ready. A key aspect was the Capstone (final year) project, which required me to work with students from different pillars to solve real-world problems and challenges. This multidisciplinary approach familiarised me with the working dynamics of a team from diverse backgrounds and is a skill very essential for working in a multinational company like MasterCard.”



Information Systems Technology and Design graduate, Joshua Cheong, now a cross-franchise management associate at Citibank said: “Learning design methodology enabled me to tackle abstract problems from an engineering perspective and break them down into different parts. From my social science courses, I also understood that technology adoption or development is not devoid of social interaction.”

EDUCATION MINISTER'S INAUGURAL VISIT TO SUTD

Acting Minister for Education (Higher Education & Skills), Mr Ong Ye Kung, made his first official visit to SUTD on 19 April. President Thomas Magnanti gave a brief introduction of SUTD and its unique pedagogy before Minister Ong was given a tour of the campus. At the SUTD-MIT International Design Centre, he was introduced to many new technologies developed by faculty and researchers, including an app that can detect early-stage cancer, a shapeshifting vacuum cleaner and various types of assistive technologies for people with disabilities.

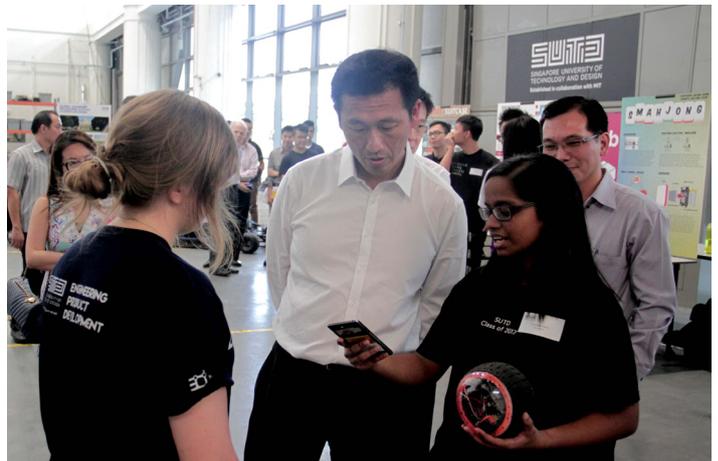
Subsequently, Minister Ong observed how classes were taught at SUTD in our revolutionary cohort classrooms, and was brought to the state-of-the-art fabrication lab, where he interacted with students who presented the projects they were working on. The Minister ended his visit with a ride on the electric vehicle (EV) designed and built by a group of freshmores from the SUTD EV Club.



Acting Minister for Education, Mr Ong Ye Kung, pays SUTD a visit.



Minister Ong test-driving an electric vehicle built by students.



Students showing Minister Ong an app they developed.

NEW GLOBAL PROGRAMMES

As part of a holistic and well-rounded education in an increasingly globalised world, having overseas exposure would beneficially widen one's experiences and development. This is why SUTD strives to offer a variety of global opportunities which include exchange and summer school programmes.

Since May 2016, more than 70% of SUTD undergraduates will be able to go for global programmes – an increase of 40% from last year. These new global programmes are in addition to SUTD's signature exchange programmes with the Massachusetts Institute of Technology and Zhejiang University, with durations ranging from three weeks to a term depending on programme type.



A student project from the ALP - a heart rate monitoring harness which senses when a dog gets excited and takes a snapshot of the surroundings.

SUTD has partnered nine prominent universities/organisations to offer the global programmes and these include Stanford University, University of California, Berkeley, Pohang University of Science and Technology, National Taiwan University and KTH Royal Institute of Technology, to name a few.

Some programmes are fully sponsored by SUTD, while others are co-funded by both the university and students or paid for by the students. There are also company internship opportunities for some of the new programmes, which are not part of existing overseas internship opportunities.

WHAT TO EXPECT FROM GLP, ALP AND SUMMER PROGRAMMES

The SUTD-MIT Global Leadership Programme (GLP):

The 10-week programme at MIT offers a unique opportunity for students to embrace and replicate the MIT spirit of entrepreneurship. The programme serves as an international social network platform for SUTD students to interact and exchange ideas with students from MIT. Through this exchange, students can gain global insights and offer creative and impactful solutions to societal and economic challenges.



A student testing out a boat they built as part of the GLP.

Winter Independent Activities Period (IAP):

This three-week programme at MIT focuses on collaboration across cultures and creativity. During the programme, students collaborate with MIT faculty, students and staff from other US universities in the IAP classes. They learn life-long skills that will allow them to better understand and work on global themes. In addition, they have the opportunity to create, prototype or design and build interesting projects. Students take at least two courses chosen from a variety of courses offered under the programme.

The Asian Leadership Programme (ALP):

This is an exciting 13-week customised design-centric summer immersion programme, organised and hosted by the International Design Institute (IDI) of Zhejiang University (ZJU), giving our students their first step into the massive Chinese economy. Up to 100 students are able to participate in this fully-funded programme which takes place in May yearly.

The programme structure for ALP encompasses the following components: Learning, Exploring and Experiencing. The Learning component requires students to take two courses - Design Thinking and Expression & Design Fiction - developed by IDI and ZJU, while under the Exploring component, students will be working on projects according to their selected themes. Under the Experiencing component, students will need to participate in seven cultural events organised by IDI, other departments in ZJU and external organisations. These events consist of culture immersion activities such as Drama Nights, visits to museums, concerts, etc.

RECORD NUMBER OF STUDENTS MATRICULATED AT SUTD IN 2016



The newly matriculated students viewing SUTD's Fifth Row showcase.

In 2010, after participating in the RoboCon Competition organised by the Singapore University of Technology and Design (SUTD), then year-one polytechnic student, Leong Hei Kern, was intrigued by the university's unique vision to 'better the world by design' and aspired to join them once he completed his diploma.

During his polytechnic years, Hei Kern did not sit on his haunches but decided to further extend his relationship with SUTD by taking on an internship at the SUTD-MIT International Design Centre in 2011 and 2012. Furthermore, after completing his national service, Hei Kern joined the Campus Builder Programme, which was designed to provide students who are waiting for matriculation into SUTD with the opportunity to be involved in key SUTD programmes and enhance their undergraduate learning experience. During the programme, he worked on programming a basic calculator, implementing a micro-controller optical tachometer and even helped conduct a workshop on producing a mini electric piano.



Students matriculating at SUTD.

In May 2016, Hei Kern joined some 450 students in matriculating at SUTD – a record high for the university since its inception and a 12.5% increase from 2015's numbers.

Another student, Blossom Tang, who plans to join either the Engineering Systems and Design or the Engineering Product Development pillar at SUTD, said: "The most compelling thing about SUTD for me is the design-oriented, hands-on pedagogy. Both engineering and architecture involve an iterative design process of creating and reviewing, and that's something I think is most effectively learnt through practice. Apart from that is the support SUTD gives to ground-up initiatives by students, whether in projects outside of class or in setting up new student clubs. It offers something different and there are so many exciting possibilities, I can't wait to begin!"

SUTD PARTNERS ST ELECTRONICS TO LAUNCH S\$44.3M CYBER SECURITY LAB

On 13 May, SUTD and Singapore Technologies Electronics Limited (ST Electronics) launched a joint cyber security laboratory. Known as the ST Electronics-SUTD Cyber Security Laboratory, it comes under the National Research Foundation's Corporate Laboratory@University Scheme, which supports the setting up of key corporate laboratories via public-private partnerships. It is the first corporate lab under this scheme to focus on cyber security.

The S\$44.3 million Lab aims to advance new frontiers in cyber security technologies as well as develop next generation products and solutions to address current and future cyber security challenges. Another purpose of the collaboration is to build up local capability in the cyber security field to support Singapore's Smart Nation Initiative by providing relevant training for talents.

Located at the SUTD campus, the 400-sqm Lab will have around 60 cyber security researchers from SUTD and ST Electronics, at full-capacity.



SUTD, ST Electronics and National Research Foundation representatives posing with Guest-of-Honour, Minister Yaacob Ibrahim.

Researchers of this Lab will kick off with R&D in three areas:

- a. Cyber security big-data analytics
- b. Developing trusted monitoring and mitigating techniques
- c. Developing innovative methods for detecting malicious and deceived insiders in an organisation.

“The ST Electronics-SUTD Cyber Security Laboratory brings together Singapore's expert cyber security capabilities under one roof. We have a shared vision of accelerating the pace of development of innovative indigenous technologies that have cross-sector applications which address current as well as future cyber security challenges,” said Mr Lee Fook Sun, Deputy CEO & President, Defence Business of ST Engineering and President of ST Electronics.



From left, Mr Lee Fook Sun, ST Electronics President, Dr Yaacob Ibrahim, Minister-in-charge of Cyber Security and Professor Chong Tow Chong, SUTD Provost.

“SUTD's collaboration with ST Electronics comes at an opportune time, as cyber security challenges become increasingly sophisticated. The joint corporate laboratory will not only enable us to testbed diverse cyber attacks in 'real world' environments and design innovative cyber security solutions, but also provide relevant training that will boost Singapore's pool of cyber security talents – a multi-pronged approach to boost our society's cyber security capabilities through design, technology and education,” said Professor Thomas Magnanti, SUTD President.

S\$3 MILLION "CREATE4GOOD CHALLENGE" FOR SUTD AND SMU STUDENTS



Create4Good Challenge finalists, together with Acting Minister for Education, Mr Ong Ye Kung, the sons of the late Mr Kwek Leng Joo and the Presidents of SUTD and SMU.

In 2015, Mr Kwek Leng Joo, the late Deputy Chairman of City Developments Limited and a strong corporate social responsibility advocate and philanthropist, made a personal donation of S\$3 million to SUTD and the Singapore Management University (SMU) to set up the Create4Good Challenge – the first of its kind in Singapore.

The Challenge brings students from both universities together and integrates their technological and entrepreneurial expertise to create innovative solutions for a smart and sustainable nation. To be held annually for five years, the Challenge requires students from both universities to work together in teams of up to seven members. The teams will propose solutions that leverage SUTD's culture of research innovations that are multidisciplinary and technically grounded, while drawing on SMU's business expertise and out-of-the-box thinking, to create a positive impact on people and society. Areas of focus may include, but are not limited to, accessibility for the elderly or physically disabled, education, palliative care and environmental sustainability.



Acting Minister for Education, Mr Ong Ye Kung, viewing the winning project by one of the Create4Good Challenge finalists.

Mr Kwek Eik Sheng, son of the late Mr Kwek Leng Joo and also Chief Strategy Officer and Head, Asset Management, City Developments Limited, said: "Through the process of collaboration and creation, it is my late father's hope that our young talents will develop broader perspectives on how they can help realise Singapore's vision of becoming not just a smart and sustainable nation, but also a caring society. My father firmly believed in empowering youths to lead change and innovation for a better future, and I am sure that he would have been very proud to see the many innovative solutions arising from this inaugural Challenge."

The first Challenge was won by Team Homage, whose idea of an online platform to deliver certified care professionals to meet the demand for in-house non-medical care services for the elderly beat 22 other teams and won over the judges. The team walked away with S\$50,000 to accelerate their ideas.

SUTD AND TNO'S COLLABORATION GIVES CYBER SECURITY RESEARCH AN INTERNATIONAL BOOST



Group picture at the MOU signing between SUTD and The Netherlands Organisation for Applied Scientific Research on cooperation in cyber security research.

Cyber attacks transcend geographical boundaries. An attacker can launch an attack from Country A using a command and control a server physically located in Country B. The server in turn controls bots (computers controlled by an attacker, unknown to the owner) located in several countries to simultaneously carry out the attack in Country C.

In response to such cyber threats and risks, a transnational collaboration was formalised in a Memorandum of Understanding (MOU) between SUTD and the Netherlands Organisation for Applied Scientific Research (TNO). Signed by SUTD's Provost Professor Chong Tow Chong and TNO's Managing Director of Defence, Safety and Security, Mr Henk Geveke, the three-year MOU covers student-researcher exchanges and research collaborations in domains spanning across Cyber Physical Systems, the Internet of Things (IoT), Block Chain Security, Dark Web Training and Cybercrime.

“Joining forces with SUTD and their testbed-environment will allow TNO to experiment with criminal strategies in a controlled setting, which will enable us to study the design of cybercrime to a fuller extent.”

Prof Chong noted: “With the growing importance of cyber security, SUTD’s collaboration with TNO is timely. The exchange of our students and researchers with TNO will greatly benefit us as it will allow us to share and learn best practices from one another as well as advance our knowledge in the area of cyber security and resilience.”

Mr Geveke, added: “Joining forces with SUTD and their testbed-environment will allow TNO to experiment with criminal strategies in a controlled setting, which will enable us to study the design of cybercrime to a fuller extent.”

SUTD S\$10K BUSINESS INNOVATION COMPETITION



Team ReHub, the winners of the SUTD S\$10K Business Innovation Competition receiving their prize money from the event keynote speaker, Dr Jeffrey Chi (left), Vice Chairman of Vickers Venture Partners. Team ReHub consists of SUTD researchers (from left to right), David Collins, Jan Rod, Denise Tan and Attila Victor Achenbach. (Image courtesy of SUTD PhotogCircle).

Modelled after the enormously successful MIT S\$100K Entrepreneurship Competition, the student-organised inaugural SUTD S\$10K Business Innovation Competition took place on 20 April at the Singapore University of Technology and Design (SUTD). The SUTD S\$10K provides a platform for aspiring entrepreneurs and inventors to develop investor-ready business plans and provides them with resources including training, seed funding and mentorship to create a new class of technology businesses.

Over a one-month period which began in March, 11 finalists in the competition were matched with experienced external mentors to further improve their business models, which they had to then present at the competition finale.

Team ReHub beat eight other teams to win the S\$10,000 grand prize. Team ReHub aims to use games to improve patient rehabilitation by developing hardware to encourage patients to continue practicing their physiotherapy exercises at home while keeping the physiotherapists and physicians in the loop during the rehabilitation process.

Team ReHub member and postdoctoral research fellow at SUTD, Mr David Collins said: "The SUTD S\$10k was a great experience that focused our thinking about what it takes to get a business off the ground and the prize money and exposure is a great springboard for developing our product. Everyone, including students, researchers and academics, should consider putting their ideas to the test in the SUTD S\$10k."

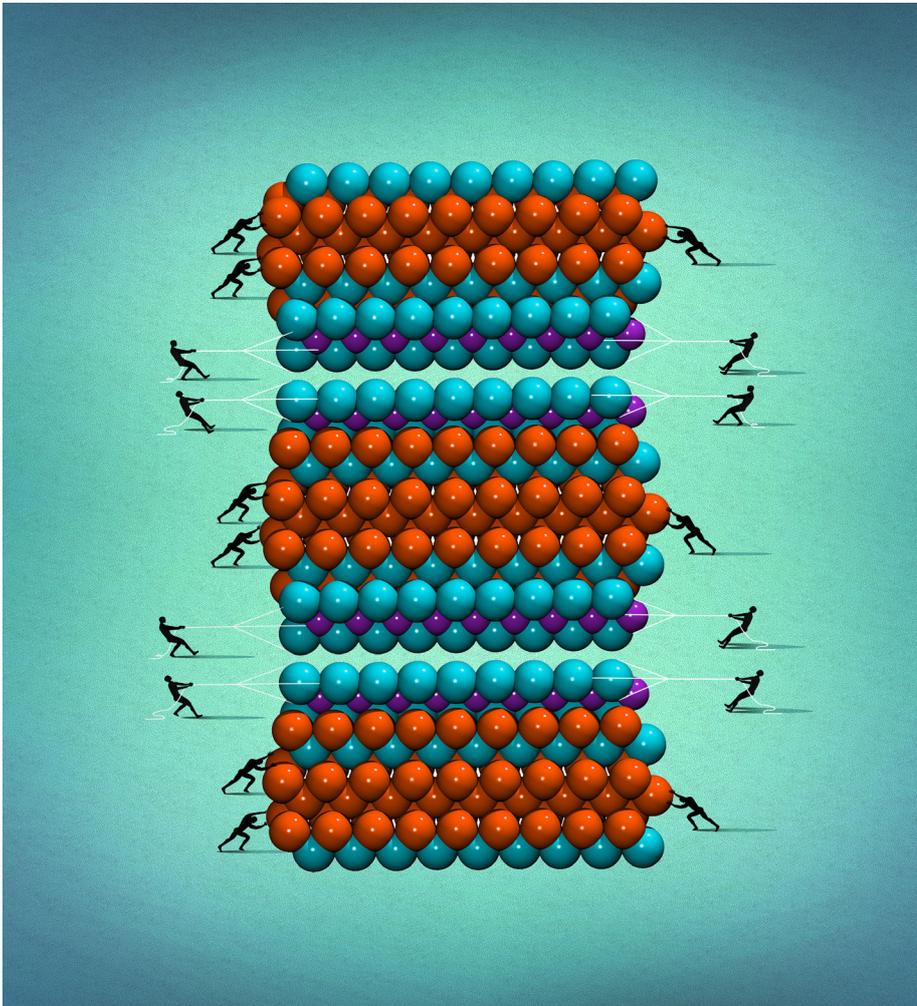
One of the judges of the competition, Mr Jeff Paine, General Partner at Golden Gate Ventures said: "The quality of the pitches was great with several hard science companies based off of solving personal problems faced. Team ReHub solves a real problem out there in the market; however, the issue with most startups is how they will be able to go to market smoothly. Startups are not easy, and their path will never be smooth but I will be rooting for them."

Furthermore, Ms Susan Conover, an MIT-SUTD Dual Masters student and co-founder and director of the competition shared about the value and potential benefits of SUTD S\$10K: "After competing in the MIT S\$100k Entrepreneurship Competition last year I found the programme to be inspiring for students to form teams around a core mission and to understand the principles and challenges of starting a company with a large global impact. Our goal for this new competition is to connect interested external mentors with high-potential teams and allow students and researchers to learn through doing and commercialise their innovations."

Going forward, the S\$10K organising committee plans to raise S\$100,000 from external investors to run the competition over the next three years.

RESEARCH REVEALS SECRET TO DESIGNING NEXT GENERATION DATA STORAGE MATERIALS

BY ROBERT EDWARD SIMPSON



SUTD researchers used strain engineering to alter the atomic structure of materials and design materials with a bespoke set of properties.

The new design approach employs a system comprising two different crystal layers that are 100,000 times thinner than a human hair. The two crystals naturally align with one another but their crystal sizes are different, causing one layer to be slightly stretched while the other is slightly compressed. This effect makes it easy to strain the structure of materials and design them to achieve new or optimised functions. This strain engineering design method represents a significant advance and a higher level of sophistication when compared to trial and error methods that are often employed in materials design and optimisation.

Assistant Professor Robert Simpson, principal investigator, said: "Our paper not only demonstrates our ability to control the properties of data storage materials but also sets a new precedent for designing the properties of other 2-dimensional materials, like graphene."

For reference:

X. Zhou et al. Phase change memory materials by design: a strain engineering approach. Adv. Mater., 28:3007–3016, 2016.

J. Kalikka et al. Strain engineered diffusive atomic switching in two-dimensional crystals. Nat Commun, 7(11983), 2016.

Over the past 50 years the world has undergone a digital revolution, and people now live in a data hungry society where high performance computing systems such as smart phones, are carried in pockets. The brain of any computer is composed of its processor and memory. Faster and more efficient memory operations means more powerful and energy efficient computing power.

Researchers from SUTD's International Design Centre recently revealed a breakthrough in the design of active materials for photonics and data storage applications. Their work showed that phase transitions can be confined to an ultra thin interface between two different crystalline materials. They reported high efficiency phase change memory devices based on these materials in the prestigious journal *Advanced Materials*. And more recently, in a second paper, which was published in *Nature Communications*, they describe a new model and a set of design rules for creating stacks of two dimensional crystals with electrically switchable properties.

Strain engineering was used to alter the atomic structure of materials and design materials with a bespoke set of properties. When this 'designed' material was incorporated in next generation data storage devices, the memory devices switched five times faster at a substantially lower voltage than traditional phase change memories.

RETHINKING THE BOUNDARIES OF TECHNOLOGY

BY BASIL YAP



SUTD President, Professor Thomas Magnanti, with Millennium Technology Prize winner, Professor Stuart Parkin.

Millennium Technology Prize winner, Professor Stuart Parkin gave a lecture titled “A fountain of ideas from the man who revolutionised the cloud” at SUTD in January 2016. In his talk, he emphasised the importance of the role innovation has played in both his career and in the field of technology.

Prof Parkin started his talk with a brief history of the evolution of technology over the last century, explaining the exponential growth of computational power of CPUs and the limitations of silicon/CMOS technology. He also listed some research on alternative ways of computing that are currently underway, such as quantum computing, cognitive computing and 3-Dimensional circuit boards. Sharing his own story, Prof Parkin spoke about the breakthrough in Giant Magnetoresistance (GMR) research in the 1990s, a new intricate superlattice structure with the potential to store binary data. However, there was the problem of finding a viable method for mass producing the GMR material, which led to his big break – he was able to devise a commercially viable method (sputter deposition) of producing the material which led to the birth of the magnetic disk drive.

Prof Parkin also shared some of his more recent research endeavours and interests, such as a 3-Dimensional Magnetic Racetrack Memory and complex computational devices that are modelled after the human brain.

Overall, Prof Parkin delivered one of the most informative and eye-opening lectures I have ever attended at SUTD. His presentation was concise and easy to understand, even for the uninitiated, while still including a lot of details in his slides for those who wished to delve further into the fields of studies he had covered. It was a great experience to hear from a man who has improved the lives of so many people with his research.

GLOBAL HEALTH TECHNOLOGIES EXHIBITION



The EEG Hat exhibit at the Global Health Technologies Exhibition.



Students testing the EEG hat.

Research on dementia has never been trendier. A student group came up with the idea of an Electroencephalography (EEG) hat that is primarily targeted at elderly suffering from early stages of dementia. In order to monitor the brainwaves of the elderly, they designed a hat with EEG electrodes attached to it. The electrodes were able to detect the brainwaves of elderly while playing a simple computer game. The brainwaves monitored while in gameplay can be a useful indicator to detect early onset of dementia.

This research arose from the 14-week Global Health Technologies module which teaches students the schematics of the biodesign innovation process and current technologies used to solve global health challenges. The theories taught in the first half of the term were put into practice in the second half of term when students formed groups to explore the current healthcare needs faced by elderly in Singapore. Student groups worked with research faculty at SUTD who had existing collaboration projects with local hospitals to design a working prototype that is testable. This is a new pedagogy approach which merged the course aims with real-life problems investigated by research faculty. The prototypes from the student projects in this course, will be further improved and modified after the course by researchers and could potentially make their way to the market in a few years. This type of sustainable student design project is a new initiative at SUTD.



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