

# 8TH SUTD-MIT IDC DESIGN SUMMIT & 2<sup>nd</sup> INTERNATIONAL CONFERENCE ON TECHNOLOGY AND DESIGN (ICTD) 2020



13 – 15 January 2020 | SINGAPORE  
"Innovation, Design and Artificial Intelligence"



科技设计国际会议  
International Conference on Technology and Design

新加坡理工设计中心  
SINGAPORE UNIVERSITY OF  
TECHNOLOGY AND DESIGN



Massachusetts  
Institute of  
Technology



PLEASE NOTE  
THERE WILL BE  
TWO LOCATIONS FOR THIS EVENT

## DAY 1, DAY 2



MAX Atria, Singapore Expo  
1 Expo Drive, Singapore 486150

## DAY 3



Singapore University of Technology and Design (SUTD)  
8 Somapah Road, Singapore 487372

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### Welcome

Welcome to the 8th SUTD-MIT IDC Summit and the 2nd International Conference on Design and Technology (ICTD) 2020

We would like to thank you for your presence at and participation in the 8th annual Design Summit, organized by the SUTD-MIT International Design Centre (IDC), and for attending the 2nd International Conference on Technology and Design (ICTD 2020), co-organized by IDC, SUTD and Zhejiang University (ZJU).

This year's Summit is a celebration of ten years of the IDC. We want to take this opportunity to share our experiences, celebrate our achievements, and discuss with you our plans for the years ahead. To mark this special occasion, we have combined the Summit with ICTD 2020, a joint venture of SUTD and ZJU, in which invited speakers will share their exciting work on and vision of Innovation, Design and Artificial Intelligence.

We hope the IDC Summit and ICTD 2020 will be thought-provoking events that will lead to new insights, exciting ideas and inspiring collaborations between disciplines. Let us lift design research, education and practice to a new level, working together the many disciplines and stakeholders to help society address the grand challenges it faces today.

Sincerely Yours,

Professor Lucienne T.M. Blessing  
Professor Christopher L. Magee  
Professor Kristin L. Wood

### The IDC Design Summit – Celebrating 10 years

The IDC Design Summit is held in January each year to bring together SUTD and MIT Principal Investigators (PIs), researchers, students and external partners from industry, academia, and government organizations in Singapore.

The objective of this year's Summit is to celebrate ten years of the IDC and look towards the next ten.

The Summit will start with an overview of ten years of achievements for which we thank all of you: they represent your work and commitment. The data show that we have many reasons to be very proud. The IDC has grown into a strong interdisciplinary community with a clear brand value, nationally and internationally, and in academia as well as in industry, through its expertise in Design Science and Design Innovation. The IDC has funded and undertaken a wide range of research projects which have benefited industry and society and resulted in over \$171 M of leveraged funding and a total of 24 startups. Research opportunities for undergraduate students have included 319 UROP and similar projects. The IDC's Design Innovation workshops, ranging from introductory to multi-day courses, have reached over 14,500 participants from public and private organizations as well as schools.

In a discussion session, we will invite you to share your experiences, reflections and lessons learned while working in or with the IDC.

What better way to celebrate and know more about the IDC's origins and development, than a panel discussion by those who conceived the IDC and made it the success it is today? The panel will share their experiences and reflect on their original vision, ideas and hopes, their view on the IDC's impact, and their visions, ideas and hopes for the IDC's future.

The second half of the afternoon is dedicated to the future. We have the honor and privilege to have SUTD's president, Prof. Chong Tow Chong, outline the future of design at SUTD. This will be followed by a summary of the IDC's strategy for the next 10 years and a discussion session focused on opportunities and recommendations for the future IDC.

We are looking forward to a day of presentations, elevator pitches and posters showcasing the exciting activities of our researchers, a panel, two discussion sessions, and ample opportunities for conversation and networking.

We look forward to welcoming you in person and working with you during this Summit!

## 2<sup>nd</sup> International Conference on Technology and Design (ICTD)

The 2nd International Conference on Technology and Design (ICTD) is co-hosted by Singapore University of Technology and Design (SUTD) and Zhejiang University (ZJU) of China. The objective of ICTD is to bridge world renowned higher education institutions and leading industry organizations to discuss the current situation, challenges and advancements relating to the rapid emergence and fusion of technology and design.

The 1st International Conference of Technology and Design, ICTD 2019 was successfully held in Hangzhou, China, in April 2019. 30 invited scholars, experts and industry leaders from 11 countries and regions participated in the conference and discussed about the trends, critical issues, opportunities and challenges in technology and design. ICTD 2019 is held in the context of technology and design becoming an important engine that continuously drives innovations to enable our society's prosperity and well-being. Especially, the ever-blurring boundaries of technology and design have presented unprecedented opportunities to higher education and industries.

The theme of ICTD 2020 is Innovation, Design and Artificial Intelligence (AI). At the conference, we hope to address but not limited to a) the relationships and interactions among innovation, design and AI; b) how to construct a multidisciplinary platform of innovation, design and AI; c) higher education and research frontiers of innovation, design and AI.



## SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN (SUTD)



The Singapore University of Technology and Design (SUTD) was established in collaboration with MIT to advance knowledge and nurture technically grounded leaders and innovators to serve societal needs. This is accomplished, with a focus on Design, through an integrated multi-disciplinary curriculum and multi-disciplinary research.

Technology and design are essential to the world's well-being and progress. Ever since the invention of the world's first light bulb, design in technology has been the forerunner of countless new discoveries. With machinery that is unsurpassed in speed and efficiency, new inventions have sprouted all over the globe. Indeed, possibilities are endless in a day and age where information is rampant and new designs and discoveries are shared the moment they emerge.

The Singapore University of Technology and Design (SUTD) aims to become the centre and stronghold of global research and breakthroughs through creative technical research and education anchored in design within a multi-disciplinary approach. We call this focus on design the Big 'D', where we do not just produce graduates well-versed in technical functionality, but a new breed of the brightest technical minds that designs the new innovations of tomorrow. We will inspire all that goes through our doors in the art and science of design to ensure that architectural, systems, services, software, product and engineering inventions of tomorrow are both a technical breakthrough and a resonating lifestyle appeal. By developing pioneering curriculum and research, this Big-D movement will further push the envelope, inspire young minds and motivate impactful achievements in innovation, society and the economy.

## SUTD-MIT INTERNATIONAL DESIGN CENTRE (IDC)



The IDC began in July 2010 as part of a Collaboration Agreement between Singapore and MIT, with a fully structured project and PI approach at MIT, and great expectations of an SUTD IDC to be created and launched. The primary objectives were:

- Quality in Design Research (Design Science),
  - Advancing Design theory and methodology
  - Using Design to create innovative solutions to key societal challenges
  - Integrating design theory and methods with design practice and education
- Value to SUTD by developing a research-intensive university and long-term Innovation in pedagogy and curriculum
- Success in talent development

As a key multidisciplinary and broad-impact Centre at SUTD and MIT, the IDC has succeeded in kickstarting research and driving design for students, faculty, staff, and external partners by collaborating and partnering with all of SUTD's departments and many departments at MIT.

The SUTD-MIT IDC is now a premier global scholarly hub for technologically intensive design science, research and practice. It is based both in Singapore at SUTD, and in Cambridge, MA at MIT, with academic and industrial partners from around the world.

IDC faculty, researchers and students study and advance the design process and design science, and develop new tools and methods for design practice and education to address the strategic needs of organisations and society. They work together with our partners to design devices, products, systems, services and elements of the built environment that address strategic needs of Singapore, the greater Asian region, the United States, and the global community.

### MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)



The mission of the Massachusetts Institute of Technology is to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century. We are also driven to bring knowledge to bear on the world's great challenges.

The Institute is an independent, coeducational, privately endowed university, organized into five Schools (architecture and planning; engineering; humanities, arts, and social sciences; management; and science). It has some 1,000 faculty members, more than 11,000 undergraduate and graduate students, and more than 130,000 living alumni.

At its founding in 1861, MIT was an educational innovation, a community of hands-on problem solvers in love with fundamental science and eager to make the world a better place. Today, that spirit still guides how we educate students on campus and how we shape new digital learning technologies to make MIT teaching accessible to millions of learners around the world.

MIT's spirit of interdisciplinary exploration has fueled many scientific breakthroughs and technological advances. A few examples: the first chemical synthesis of penicillin and vitamin A. The development of radar and creation of inertial guidance systems. The invention of magnetic core memory, which enabled the development of digital computers. Major contributions to the Human Genome Project. The discovery of quarks. The invention of the electronic spreadsheet and of encryption systems that enable e-commerce. The creation of GPS. Pioneering 3D printing. The concept of the expanding universe.

Current research and education areas include digital learning; nanotechnology; sustainable energy, the environment, climate adaptation, and global water and food security; Big Data, cybersecurity, robotics, and artificial intelligence; human health, including cancer, HIV, autism, Alzheimer's, and dyslexia; biological engineering and CRISPR technology; poverty alleviation; advanced manufacturing; and innovation and entrepreneurship.

MIT's impact also includes the work of our alumni. One way MIT graduates drive progress is by starting companies that deliver new ideas to the world. A study estimated that as of 2014,

living MIT alumni have launched more than 30,000 active companies, creating 4.6 million jobs and generating roughly \$1.9 trillion in annual revenue. Taken together, this "MIT Nation" is equivalent to the 10th-largest economy in the world!

Technology and design are essential to the world's well-being and progress. Ever since the invention of the world's first light bulb, design in technology has been the forerunner of countless new discoveries. With machinery that is unsurpassed in speed and efficiency, new inventions have sprouted all over the globe. Indeed, possibilities are endless in a day and age where information is rampant and new designs and discoveries are shared the moment they emerge.

## ZHEJIANG UNIVERSITY (ZJU)



Zhejiang University (ZJU) is one of China's top higher education institutions, as well as one of its oldest; its roots can be traced back to 1897 and the founding of the Qiushi Academy.

Located in Hangzhou – one of China's most picturesque cities – the University is organized across seven faculties and 37 schools. It is home to 3,741 full-time faculty members, including 46 members of the Chinese Academy of Sciences and the Chinese Academy of Engineering. ZJU has 54,641 students, over 53% of whom are postgraduate students.

Laying claim to several areas of research strength, ZJU currently ranks among the top three on Chinese mainland and within the top 100 in the Times Higher Education World Reputation Rankings and QS World University Rankings. Eighteen disciplines of ZJU have been selected for China's "Double First-class" Initiative (3rd in China) and 39 disciplines graded A in the recent national assessment (1st in China).

The University prides itself on a culture of innovation and entrepreneurship. ZJU researchers are making an impact across many priority areas that address global challenges, including artificial intelligence, assembly technology for large aircraft, clean energy, ocean technology, industrial control technology, and global public health initiatives related to the prevention and treatment of infectious diseases. ZJU is also renowned for the number of business start-ups it spins off. Over 100 of its alumni sit at the helm of domestic or overseas listed companies, making the University synonymous with excellence and leadership.

ZJU is committed to transforming China and the world through active engagement. Major innovative developments include the creation of a high-level platform for intellectual property exchange, as well as the formation of a number of think-tanks, including the China Academy of Western Region Development, the National Research Center for Agricultural and Rural Development, and the Institute for Public Policy, which exist to extend the scope of ZJU's research in social sciences.

ZJU has partnerships in place with more than 190 institutions from more than 30 countries worldwide. Included among them are such leading institutions as Imperial College London, the University of Sydney and the University of Illinois at Urbana-Champaign.

With a cohort of 7,074 international students, and around 8,000 faculty and students who participate annually in various overseas mobility programs, ZJU fully harnesses its extensive network to nurture talent with a global outlook. In collaboration with the Universities of Edinburgh and Illinois it has also established the ZJU-UoE and ZJU-UIUC Institutes on Haining International Campus.

Chief among ZJU's aims is the aspiration to become a world-class university with a distinctively Chinese character, where tradition and modernity are successfully combined.

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"Innovation, Design and Artificial Intelligence"

Day 1 : Monday, 13 January @Expo Venue: MAX Atria, 1 Expo Drive, #02-01, Singapore 486150		8th SUTD-MIT IDC Design Summit	
Morning	08:00		Arrival and Registration + Breakfast (provided) + Posters / Exhibition
	09:00		Welcome to the 8th SUTD-MIT IDC Design Summit
	09:15		The IDC – looking back in numbers
	10:00		IDC Funded Projects: examples of Impact
	10:40		Break + Posters / Exhibition
	11:00		<b>Workshop: lessons learned, reflection, contribution</b>
Lunch	12:00		Elevator Pitches
	12:30		Lunch (provided) + Posters / Exhibition
Afternoon	13:30		Presentations of Workshop Results
	14:20		Opening for Panel Discussion <i>by President Emeritus Thomas Magnanti (SUTD) and Prof. Daniel Frey (MIT)</i>
	14:35		Panel Discussion on 10 Years IDC and Beyond <i>Moderator: Prof. Peter Jackson (SUTD)</i>
	15:25		Break (refreshments provided) + Posters / Exhibition
	15:45		The Future of Design at SUTD <i>by President Chong Tow Chong (SUTD)</i>
	15:55		IDC Post 2020
	16:15	Discussion: opportunities, recommendations	
	17:00	Presentations of Discussion Results	
	17:30	Close of Day 1	



Prof. Chong Tow Chong

President  
Singapore University of Technology and Design (SUTD)  
Chair, International Conference of Technology and Design 2020  
Singapore

The Future of Design at SUTD

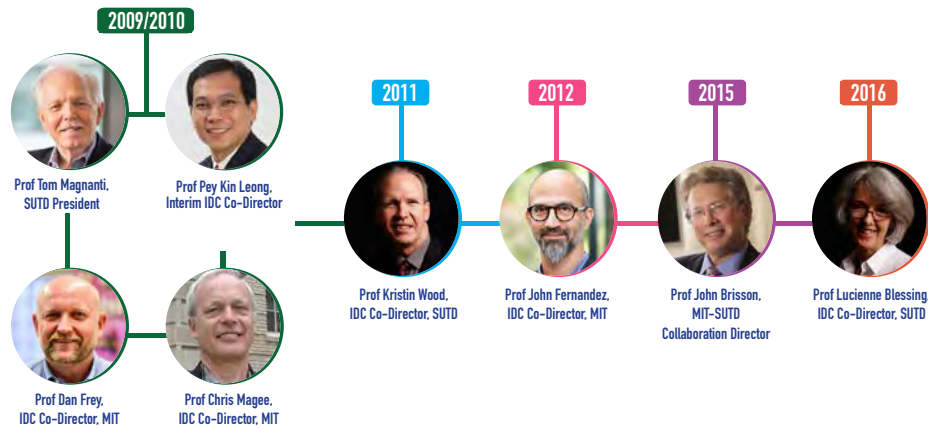
Professor Chong Tow Chong was appointed President of the Singapore University of Technology and Design (SUTD) in April 2018. He had been SUTD's founding Provost since 2010, where he played an instrumental role in steering the strategic development and operationalisation of SUTD. As President, he provides leadership and guidance in the next phase of the University's growth and development, as well as ensuring continuity in the pursuit of SUTD's vision, mission and strategic goals.

Prior to joining SUTD, Prof Chong had been the Executive Director of A\*STAR's Science and Engineering Research Council and Data Storage Institute for 15 years. He also had a 30-year academic career with the National University of Singapore as Professor of Electrical and Computer Engineering.

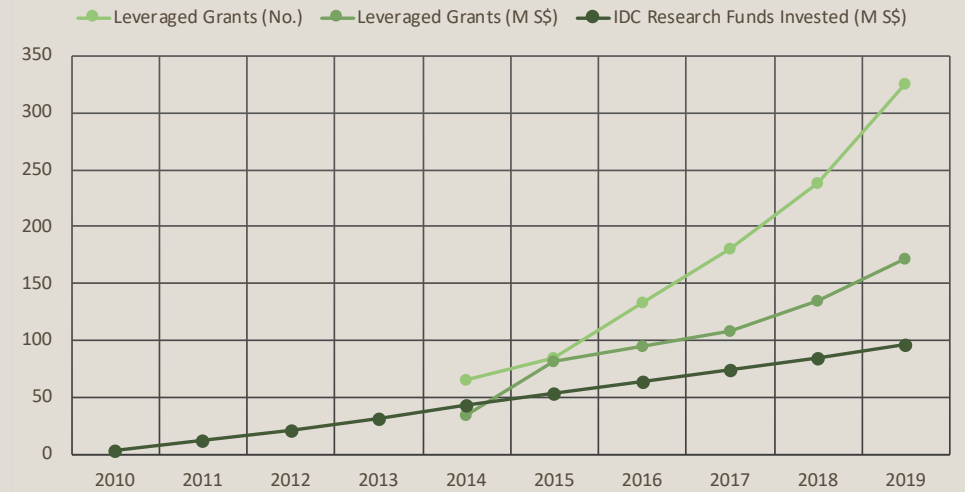
Prof Chong authored and co-authored over 400 publications in international refereed journals, presented over 35 invited talks and registered 25 patents. He was recipient of the President's Science and Technology Medal, the Public Administration Medal (Silver), the ASME ISPS Division Leadership in Research and Development Award and the Teaching Excellence Award from NUS.



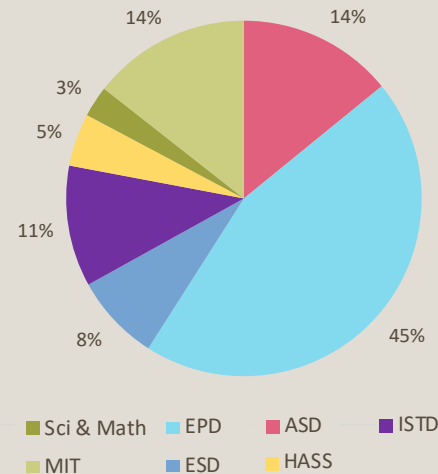
# IDC HISTORICAL OVERVIEW



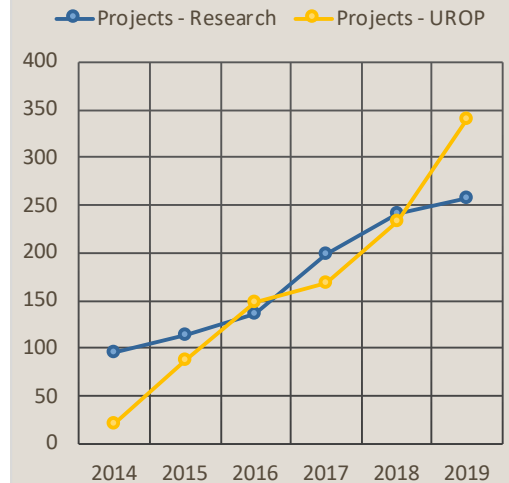
# \$97M RESEARCH FUNDS INVESTED, OVER \$171M IN LEVERAGED GRANTS (CUMULATIVE)



## Number of SUTD IDC projects and faculty involvement

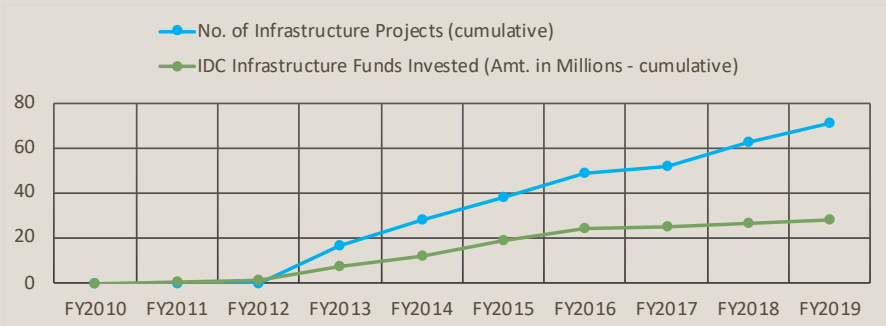


## No. of Projects (cumulative)

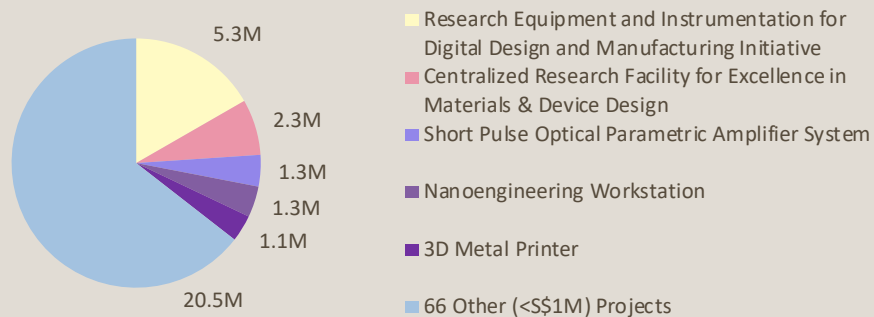


## IDC HISTORICAL OVERVIEW

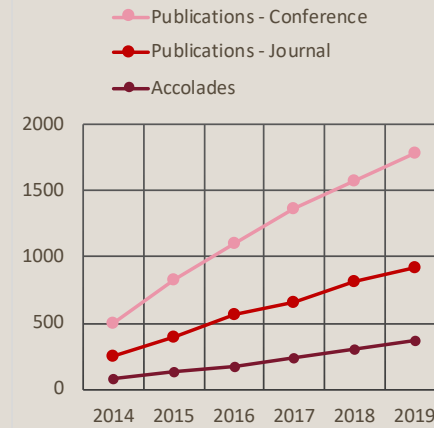
### \$26.4M INFRASTRUCTURE FUNDS INVESTED IN SUTD (CUMULATIVE)



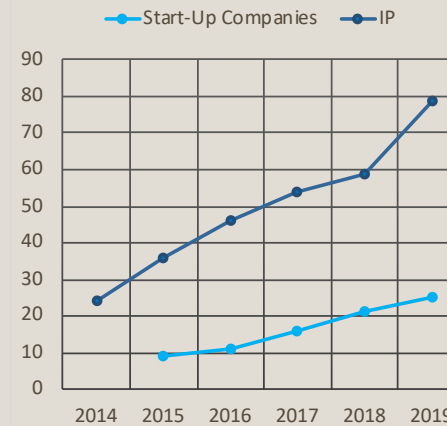
#### Examples of Infrastructure Projects



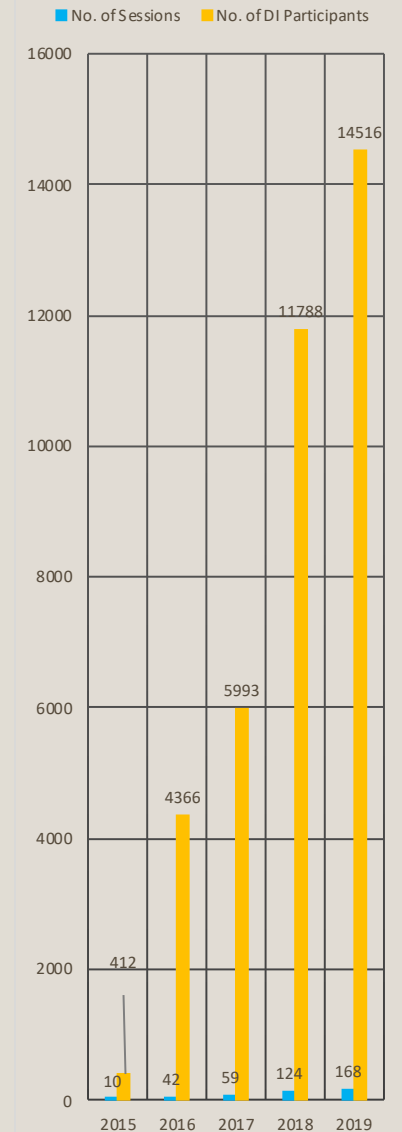
#### Publications, Accolades (cumulative)



#### Start-Up Companies, IP (cumulative)



#### Professional Development (cumulative)



**Introduction**

Design is increasingly part of the strategies of public and private organisations. Embedding design throughout an organization has shown to be a key driver of innovation and value creation resulting in higher profits and competitiveness, as well as an effective approach to address societal problems. Education is following suit, introducing design into non-design curriculum to ensure a future-ready workforce. Singapore’s recent Design Education Review Committee report recommends “embedding design into the national mindset as an essential life skill” to help people “better navigate complex problems in the volatile, uncertain, complex and ambiguous world.”.

We believe that the IDC has the experience and institutional context to

- leverage the huge opportunity for growth and leadership in Design Science, design education and design practice, in particular in and with the disciplines,
- develop the next generation Design science, Education and Practice
- be a major player in the country’s efforts to improve society’s prosperity and well-being;
- strengthen the D in SUTD to become the top world institution in technology and design; and
- provide the capabilities necessary for the future economy and society by incorporating Design Science and Innovation into the fabric of our society through education and training.

**Vision**

The IDC is the world’s premier scholarly hub for technologically intensive, transdisciplinary design research, practice and education, aimed at creating a better world.

**Goals**

**Design research, education and practice**

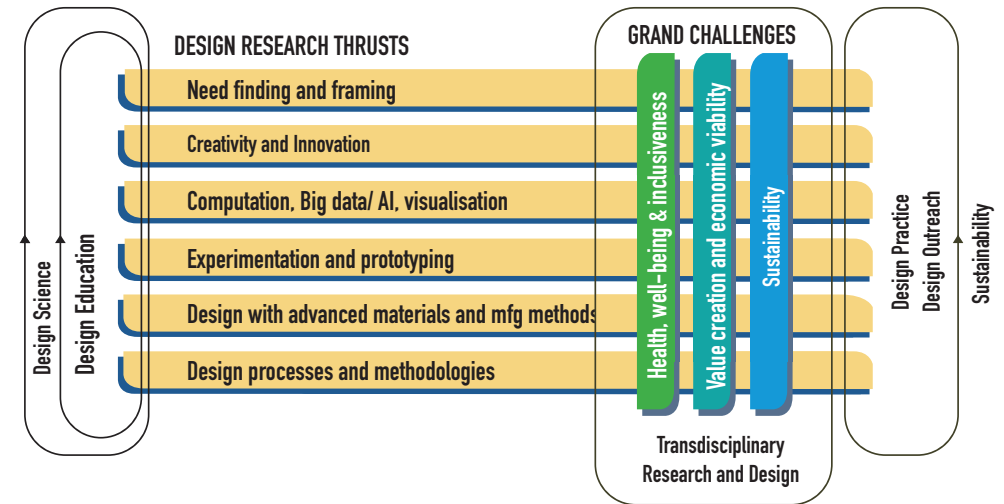
- To advance and transform Design Science > body of knowledge, paradigms, core topics
- To advance Design Science and Innovation in and with the disciplines > transdisciplinarity
- To advance and transform Design Education > effective, efficient, innovative pedagogy
- To advance and transform organizations and society through Design Innovation > training, guidance, evidence-based methods and tools

**Organisation**

- To create a sustainable unit within SUTD to secure the D in SUTD in education and research
- To create a sustainable platform to support and deepen the SUTD/MIT collaborations.
- To use the IDC platform to create a global network to “better the world by design”
- To develop and promote the SUTD Design Brand

**Focus Areas**

As in Phase 1, the IDC intends to pursue six areas of design research that are critically important to advance Design Science and ultimately affect design education and practice – the Design Research Thrusts. To ground the research, three critical societal needs – the Grand Challenges – were chosen. Research projects will address one or more Design Research Thrusts and one or more Grand Challenges, and are aimed at advancement of Design Science, education and practice. Both the Design Research Thrusts and the Grand Challenges have been adapted to the advancements made thus far and new emerging and promising areas of research. In addition, three integrative areas were identified: Design Science, Design Education, and Transdisciplinary research and design.



### Grand Challenges

The Grand Challenges represent critical societal needs where there exist larger-than-life barriers (and opportunities) without foreseeable solutions in the near future. It is important to undertake grand challenges as part of a forward-looking and innovative Centre in technologically-intensive design. By defining Grand Challenges, the work of the Centre is placed at the forefront of technology, engaged in problems and projects that are important to society, to the country, and to the Centre personnel, and developing results that have the potential for radical innovation and meaning. The Grand challenges are chosen to provide an opportunity for leadership and build on IDC's capabilities and that of its parent institutions.

The new Grand Challenges focus on the contribution of Design Innovation and Design Science at three levels:

- individual and community level (Health, well-being and inclusiveness);
- business and economy level (Value creation and economic viability);
- society and planet level (Sustainability).

### Design Research Thrusts

Design Research Thrusts define the areas of design research that are critically important to advance design science, and ultimately affect design education and practice. The full-value chain of design, from identification of an opportunity through implementation and sustainable operation, define innumerable possibilities and thrusts that could be pursued. The focus will be on:

- Need finding and framing - Understanding and advancing the ability to identify needs, challenges and opportunities through a systems approach focused on stakeholder experiences
- Creativity and Innovation - Understanding and advancing the ability to create and innovate
- Design computation, AI, visualization - Understanding and advancing complex system analysis, evaluation and decision making using computation
- Design experimentation and prototyping - Understanding and advancing complex system analysis, evaluation and decision making using experimentation and prototyping
- Design with advanced materials and manufacturing methods - Understanding and advancing embodiment design and the creation of novel solutions through exploitation of opportunities of advanced materials and additive manufacturing
- Design methodologies and processes - Understanding and advancing the process of innovating systems, products and services.

### Design Research Thrusts

New in the matrix and unique are the three integrative areas of research aimed at integration of research results to enable the IDC to truly transform Design Science as a discipline, Design Education, and Design Research and Design Innovation in and with the disciplines. This transformation will lead to an increased impact. These are:

#### Design Science

- Advance design science: the rigorous and actionable study of design with emphasis on the Design Research Thrusts (DRTs); the integration of DRT output into a coherent and structured body of knowledge, theories, models, taxonomies, etc.
- Transformation of the discipline: Alternative theoretical paradigms and methodological tools, cultures and historical legacies. Transdisciplinary research. Integration of social sciences to provoke and encourage critical self-reflection on technically intensive design situations represented by the DRT.

#### Design Education

- Design education and pedagogy: Development of a national level Design Innovation education and pedagogy, and of professional development of innovation capabilities.
- Design education research: Evaluation, improvement and renewal of design education; Translation and implementation of the body of knowledge from the Design Research Thrusts into evidence-based educational material.

#### Transdisciplinary Research and Design

- Design in the disciplines: the use of design approaches for the development of e.g. instrumentation, and for harnessing the potential of science into value through design
- Design research with the disciplines: Reliable translation of scientific results into design knowledge, guidelines, methods and tools for education and practice.  
Transdisciplinary knowledge creation: Processes for co-creation and co-research

### Design Practice and Outreach

Design practice and outreach to society is realized through the DI@SG programme involving Design Education, Design Guidance and Design Incubation

#### Design Innovation (DI) @SG

Providing world class professional Design Education, Guidance & Incubation support, across the entire design and innovation value chain, to a wide spectrum of local enterprises, government, and social stakeholders in Singapore

##### Design Education

Design Training & Professional Development program for private & public sector professionals and students, focusing on core design & innovation thinking abilities & skillsets.

##### Design Guidance

Targeted design consultations providing design & innovation support to enterprises participating in the DI@SG platform

##### Design Incubation

Enterprise Incubation and acceleration program for Singapore-based technology startups, leveraging the resources and innovation expertise of SUTD

Day 2 : Tuesday, 14 January @Expo		Venue: MAX Atria, 1 Expo Drive, #02-01, Singapore 486150	
	08:00	Arrival and Registration + Breakfast (provided) + Posters / Exhibition	8th SUTD-MIT IDC Design Summit & ICTD 2020
Host: Prof Lim Seh Chun	09:00	Welcome Address of ICTD 2020 <i>President Chong Tow Chong (SUTD)</i> <i>Vice President He Lian Zhen (ZJU)</i> <i>Senior Minister of State Chee Hong Tat (MTI, MOE)</i> <i>Director (SUTD) IDC, Lucienne Blessing (SUTD)</i>	
Session I Chair: Prof Yeo Kiat Seng	09:50	Technology Driven Design <i>By Mr. Scott Maguire (Dyson)</i>	
	10:10	A Design-Based Model for Technological Change <i>By Prof. Chris Magee (MIT)</i>	
	10:30	Novel Developments in AI in Design <i>By Prof. John Gero (UNC)</i>	
	10:50	Break (refreshment provided) + Posters / Exhibition	
	11:20	AI for Design: Virtual Design Assistant <i>By Prof. Sang-Gook Kim (MIT)</i>	
	11:40	Data-Driven Service Design <i>By Prof. Luo Shijian (ZJU)</i>	
	12:00	The Morality of Technology and the Role of Designers <i>By Prof. Lucienne Blessing (SUTD)</i>	
Lunch	12:20	Lunch (provided) + Posters / Exhibition	
Session II Chair: Prof Chua Chee Kai	13:40	Fundamentals of Empathy and Creativity <i>By Assoc/Prof. Katja Hölttä-Otto (Aalto)</i>	
	14:00	Exploration on the Construction of Innovation-Oriented Design Thinking Curriculum <i>By Prof. Han Ting (SJTU)</i>	
	14:20	Concepts: A New Abstraction for Software Design <i>By Prof. Daniel Jackson (MIT)</i>	
	14:40	Designing a workable AI-enabled clinical process: CGMH experiences <i>By Prof. Chang-Fu Kuo (CGMH)</i>	
	15:00	How to Talk with a Designer about AI <i>By Prof. Gerd Kortuem (TU Delft)</i>	
	15:20	Break (refreshment provided) + Posters / Exhibition	
	15:40	Design-led Technological Innovation <i>By Mr. Mark Wee (DesignSingapore Council)</i>	
	16:00	How SUTD Incorporates Design and AI into Its Undergraduate Programme and Growth Sectors <i>By Prof. Pey Kin Leong (SUTD)</i>	
	16:20	Panel Discussion on Design <i>Moderator: Prof. Lucienne Blessing (SUTD)</i>	
	17:20	Close of Day 2	



**Chee Hong Tat**  
 Senior Minister of State  
 Ministry of Trade and Industry  
 Ministry of Education  
 Singapore

Mr Chee Hong Tat was appointed Senior Minister of State for Trade and Industry and Education on 1 May 2018. He was first elected as a Member of Parliament for the Bishan-Toa Payoh Group Representation Constituency (GRC) in the 2015 General Elections, and appointed Minister of State for Health and Communications & Information on 1 October 2015. He was promoted to Senior Minister of State on 1 May 2017.

Mr Chee joined the Civil Service in 1998 and worked at the Ministry of Home Affairs, Ministry of Finance, Ministry of Transport and Ministry of Education. He was appointed Principal Private Secretary to then Minister Mentor Mr Lee Kuan Yew in 2008. Following that, Mr Chee became Chief Executive of the Energy Market Authority in 2011, and was appointed Second Permanent Secretary at the Ministry of Trade and Industry in 2014.

Mr Chee graduated from the University of California at Berkeley in 1996 with a Bachelor of Science (Highest Honours) in Electrical Engineering and Computer Science and a Bachelor of Arts (Highest Honours) in Economics. He obtained his Masters of Business Administration from Adelaide University in 2006.

Mr Chee was born in 1973 and is married with four children.



**Dr. He Lianzhen**  
Vice President, International  
Zhejiang University (ZJU)  
China

Professor Dr. HE Lianzhen assumed the role as Vice President, International, of Zhejiang University in June 2018. She also serves as dean of ZJU's International Campus concurrently.

Prior to her current position, Dr. HE was dean of School of International Studies from April, 2009 to November, 2016 and dean of the Academy of Humanities and Social Sciences from July, 2016 to April, 2017.

Dr. HE got her Master's degree in Applied Linguistics from the University of Birmingham, UK (1992) and her PhD degree in Linguistics and Applied Linguistics from Guangdong Foreign Studies University, China (1998). Her main research interests are language assessment, applied linguistics, and discourse analysis. She was senior visiting scholar at University of California at Los Angeles in 2004, Benjamin Meaker Visiting Professor at University of Bristol in 2014. Her publications include articles on language assessment research in top journals like Language Testing, Language Assessment Quarterly, and many key journals in China.

She is also director of the National Advisory Board for College Foreign Language Teaching of the Ministry of Education, director of Research Institute of Applied Linguistics at Zhejiang University and co-director of Zhejiang-Bristol Joint Research Center on Language Assessment. She was awarded National Professor of Distinction by Chinese Ministry of Education in 2006.



**Prof. Chong Tow Chong**

President  
Singapore University of Technology and Design (SUTD)  
Chair, International Conference of Technology and Design 2020  
Singapore



**Prof. Lucienne Blessing**

Co-Director, SUTD-MIT International Design Centre (IDC)  
Professor, Engineering and Product Development Pillar  
Singapore University of Technology and Design (SUTD)  
Singapore



**Scott Maguire**

Vice President, Global Engineering and Operations  
Dyson  
Singapore

**Technology Driven Design**

**Biography**

Scott Maguire is Dyson's Vice President for Global Engineering and Operations leading the development, manufacturing and supply of technologies from concept to production across all categories. Scott leads the global technology teams across our Malmesbury, Malaysia, Singapore, Philippines, Shanghai and Bristol sites. Scott is also actively involved in Dyson's University Programmes, passionate about our investment in young engineering talent.



**Prof. Chris Magee**

Co-Director, SUTD-MIT International Design Centre (IDC)  
 Professor of Practice, Institute Data Systems and Society (IDSS)  
 Professor of Practice, Mechanical Engineering  
 Massachusetts Institute of Technology (MIT)  
 USA

**A Design-based Model for Technological Change**

**Abstract**

Technological change is an important socio-technical phenomenon with complex combinations of several kinds. Scientific advances, invention and product/service innovation all play roles and each of these three areas is a large complex array with social as well as technical factors at play. Nonetheless, empirical evidence shows that some simple relationships/regularities exist that allow more understanding and prediction than usually recognized. This simplicity-from-complexity is sharply seen in the subtle effects that “spillover” has in technological change. In this presentation, what has been learned about the design process from design research will be shown to be consistent with these regularities and the resulting model suggests factors which need more attention in both research on design and research on technological change.

**Biography**

Professor Christopher L. Magee has been with MIT since January 2002 as a Professor of Practice in the Institute for Data, Systems and Society (IDSS) and Mechanical Engineering. He also co-directs a multidisciplinary research center (SUTD/MIT International Design Center). Before Dr. Magee joined MIT, he had more than 35 years of experience at Ford Motor Company beginning in the Scientific Research Laboratory and progressing through a series of management positions to Executive Director of Programs and Advanced Engineering. Dr. Magee is currently engaged in research on technological progress with emphasis on quantification and prediction. His interests in engineering education have focused on creativity, design and socio-technical systems; he has co-published two books and about 50 papers during his time at MIT.

Dr. Magee is a member of the National Academy of Engineering, a fellow of ASM and SAE and a participant on major National Research Council Studies.



**Prof. John Gero**

Research Professor, Computer Science and Architecture  
 University of North Carolina at Charlotte  
 Krasnow Institute for Advanced Study  
 USA

**Novel Developments in AI in Design**

**Abstract**

Artificial intelligence (AI) in design aims to produce results that if humans produced those designs we would say they were the result of intelligence. This does not imply that AI uses the same processes as humans as only the results are compared. For designs to be considered creative they must not only be novel and useful but also be unexpected. This implies that the space of possible designs need to change. This talk will briefly present the two main branches of current AI in design: knowledge-based design and deep learning-based design. It will describe examples of current capabilities. In the future, AI may be able to produce results beyond the capabilities of humans.

**Biography**

John Gero is a Research Professor in Computer Science and Architecture at the University of North Carolina, Charlotte, and at the Krasnow Institute for Advanced Study. Formerly he was Professor of Design Science and Co-Director of the Key Centre of Design Computing and Cognition, at the University of Sydney. He is the author or editor of 52 books and over 700 papers and book chapters in the fields of artificial intelligence, design science, design computing, design cognition and design neurocognition. He has been a Visiting Professor of Architecture, Artificial Intelligence, Civil Engineering, Cognitive Science, Computer Science, Design and Computation or Mechanical Engineering at MIT, UC-Berkeley, UCLA, Columbia and CMU in the USA, at Strathclyde, and Loughborough in the UK, at INSA-Lyon and Provence n France and at EPFL in Switzerland. He is the chair of the International Conference series Design Computing and Cognition and is the Co-Editor-in-Chief of the international journal Design Science.





### Prof. Sang-Gook Kim

Professor, Mechanical Engineering  
Massachusetts Institute of Technology (MIT)  
USA

#### AI for Design: Virtual Design Assistant

##### Abstract

Engineering faces many wicked problems: irreducibly interdisciplinary with multiple competing objectives, and of such large scale and complexity that will require processes to deeply rely on human insights and power of computation. The resurgence of machine learning offers the possibility for new forms of human/computer collaboration in design where each fuels hybrid intelligence in complementary ways. With the recent advancements in Deep Learning and Natural Language Processing, functional requirements (FRs) and design parameters (DPs), which are expressed as words and sentences, can be represented in a vector space. A deep learning-based abstraction process was developed to provide VDA a function to extract/abstract structured functional requirements from unstructured design specifications and customer needs. We also found that semantic similarity among functional requirements (FRs) and design parameters (DPs) represented in vector space could be used to compute quantitatively the functional independence which demonstrates a high potential to develop a robust, fine-tuned design language representation model as a part of our effort to define design intelligence. A concept of “virtual design assistant” (VDA) is being developed to have three core functions to understand designer’s natural language in the syntax of functional requirements, to implement design principles for good design decisions, like Axiomatic Design (AD), and to provide assistive design suggestions for designers to navigate between functional and physical domains.

##### Biography

Sang-Gook Kim is a full professor in the Department of Mechanical Engineering. He received his B.S. degree from Seoul National University (1978), M.S. from KAIST (1980), and Ph.D. from MIT (1985). He held positions at Axiomatics Co., Cambridge, MA (1986) and Korea Institute of Science and Technology (1986-1991). Then he became a corporate executive director at Daewoo Corporation, Korea, and directed the Central Research Institute of Daewoo Electronics Co. until he joined MIT in 2000. He is currently the Micro/Nano Area Head of the Department of Mechanical Engineering at MIT. Prof. Kim’s research has been in the field of product realization throughout his career at both the industry and academia. His recent research includes piezoelectric MEMS energy harvesting, nano-engineered energy conversion devices and solar absorbers and, most recently, AI for design. He is a fellow of CIRP (International Academy for Production Engineering), fellow of ASME, and overseas member of Korean National Academy of Engineering.



### Prof. Luo Shijian

Professor, Industrial Design  
Zhejiang University (ZJU)  
China

#### Data-Driven Service Design

##### Abstract

Service design innovation is a new form of innovation after technology innovation, market innovation and management innovation. Good service can provide good experience, good business and create good value. With the rapid development of Mobile Internet, big data and AI, data has created new opportunity and possibility for service design, which can provide objective scientific basis for marketing, manufacturing, product R&D, and user study. The proper use of user subjective thinking data and objective behavior data, including dynamic user portrait, user journey map, data analysis template, et al, can improve business transformation, customer loyalty and repurchase rate.

##### Biography

Dr. Luo Shijian is a professor at Department of Industrial Design, College of Computer Science and Technology, Zhejiang University. He studied at the University of Art and Design Helsinki, Finland from 2008 to 2009 as a Visiting Scholar. From 2002 to 2003, he studied at School of Design, the Hong Kong Polytechnic University as a Research Assistant. He is an editor of the International Journal of Industrial Ergonomics. He has finished more than 20 projects such as the National 863 Program, the National Natural Science Foundation Project, the National Science and Technology Support Project, et al. He has won 2 provincial-level scientific and technological progress awards. He has published more than 100 SCI/SSCI/EI indexed papers and 8 books, obtained more than 100 software copyrights and design patents. He has won more than 20 world famous design awards, such as Red Dot, IF, IDEA, et al.



**Prof. Lucienne Blessing**

Co-Director, SUTD-MIT International Design Centre (IDC)  
 Professor, Engineering and Product Development Pillar  
 Singapore University of Technology and Design (SUTD)  
 Singapore

**The Morality of Technology and the Role of Designers**

**Abstract**

Technologies tend to be discussed in terms of their intended functionality, feasibility and viability, yet their impact goes well beyond this focus. Technology determines many aspects of our lives, of our future, and of society and environment, as it influences how we act and decide. Designing technology, therefore, should not only be about creating products, systems, services, environments, strategies, policies or processes, but also – and foremost – about creating change in the form of new experiences and new behaviours, which may be context-dependent. This raises the issue of ethics. If technologies enable and play an active or even decisive role in shaping experiences, behavior and decisions, technologies influence morality, i.e. the norms and values that exist in society about how to act and about what is good or right. When their impact reaches beyond the intended functionality and well into the future, “technology has morality” (Van de Poel and Royakkers). Ethics, as “systematic reflection on what is moral”, should therefore be an essential part of (engineering) design practice and education.

**Biography**

Lucienne studied in Delft (MSc) and Twente (PhD), was lecturer at University of Twente (Netherlands); Senior Research Associate at Cambridge University Engineering Design Centre; Vice-president for Research and International Relations and Professor in Engineering Design and Methodology at Technical University Berlin; vice-president for Research and Professor in Engineering Design and Methodology at University of Luxembourg; interim Director of University of the Greater Region (a consortium of 6 universities in Germany, France, Belgium and Luxembourg).

Research interests: Empirical studies into design; Design theory, methods and methodologies; System design; User experience; Design research methodology, Transdisciplinarity.

Lucienne has 30 years of teaching experience in product development and design research, supervised over 30 PhD students, was Editor-in-Chief (Europe) of Research in Engineering Design (Springer), translated Pahl and Beitz' Engineering Design with Ken Wallace, and co-founded the Design Society and served on its Management and Advisory Boards for 18 years.



**Prof. Katja Hölttä-Otto**

Associate Professor, Product Development  
 Aalto University  
 Finland

**Fundamentals of Empathy and Creativity**

**Abstract**

This talk will focus on two phases of early design process – understanding the user and ideation. These two areas involve two attributes often credited to being human – empathy and creativity. This talk will dive into mechanisms behind these attributes and design methods. This talk will discuss the latest empathy research in using methods from psychology and neuro science to measure user understanding. This talk will also provide a new look into how we see creativity methods, what they consists of and why decomposing methods into creativity mechanism might be a better idea. This talk will lay a foundation for a discussion on what aspects, if any, of empathy and creativity are human and do they have to be.

**Biography**

Katja Holttä-Otto is an Associate Professor of Product Development and Aalto University. Prior to joining Aalto Katja was a professor in SUTD Engineering Product Development Pillar and UMass Dartmouth, USA. Her research areas include empathy, user centered design, creativity and need finding. She is interested in how empathy and creativity can be developed and learned and how creativity evolves during engineering education. She is also interested in novel methods for finding latent needs, needs not expressed by the user. She is also active in the area of systems engineering and does research in complex system architecture. Prof. Hölttä-Otto is passionate about interdisciplinarity and teaches product development methods including design thinking. She is in charge of the ME310 Global Innovation Program at Aalto University: <http://me310.aalto.fi/>, which is part of the global SUGAR network on global interdisciplinary design thinking (<http://sugar-network.org/>).

Prof. Hölttä-Otto is a recipient of the NSF CAREER award and has won nine best paper awards or similar distinctions. She is an associate editor for the ASME Journal of Mechanical Design and an active member of the ASME Design Theory and Methodology community.



**Prof. Han Ting**  
Deputy Dean, School of Design  
Shanghai Jiao Tong University (SJTU)  
China

### Exploration on the Construction of Innovation-oriented Design Thinking Curriculum

#### Abstract

Introduces the concept of "human-centered Design Thinking", which can be described as a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity.

Content summary:

1. The third innovation -- design-driven innovation;
2. Design thinking: people, technology and experience
3. Middle school, high school and university, creative and innovative thinking education practice.

#### Biography

Ting Han, deputy dean of school of design, Shanghai Jiao Tong University, professor, doctoral supervisor, Shanghai PuJiang Talent Scholar, member of National Instructive Committee of Industrial Design Education, deputy secretary general of China Innovation Design Industry Strategic Alliance, member of management committee of Shanghai Design Capital Promotion Center. First prize of Shanghai teaching achievement award, second prize of Shanghai Philosophy and Social Science Excellent Achievement aAward.

He provides design research and consumer research services for many international companies in local market. His clients include Intel, Nissan, Mazda, Hp, Yamaha, GE, Panasonic, Samsung etc. His research area focuses on Design Strategy & Design Planning, User Research & Experience Design, Interaction Design & Service Design.



**Prof. Daniel Jackson**  
Professor, Computer Science  
Massachusetts Institute of Technology (MIT)  
USA

### A New Abstraction for Software Design

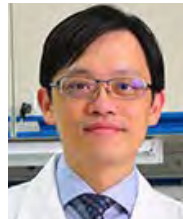
#### Abstract

The key to making software more usable and more reliable is having more robust underlying abstractions, which are then reflected in all aspects of the system: the user's mental model, the user interface, and the structures of the implementation. In this very brief talk, I'll mention some of the key ideas behind a new theory of software design based on concepts—polymorphic, free-standing and reusable units of behavior—and will illustrate some design principles on some familiar applications.

More information about the project may be found at <http://sdg.csail.mit.edu/projects/conceptual>, and a draft book is available at <https://www.amazon.com/Design-Concept-Think-about-Software/dp/1796666963/>.

#### Biography

Daniel Jackson is Professor of Computer Science at MIT, a MacVicar teaching fellow, and an Associate Director of the Computer Science and Artificial Intelligence Laboratory. He was the lead designer of the Alloy modelling language, and author of "Software Abstractions: Logic, Language, and Analysis" (MIT Press; second ed. 2012). He was a recipient of the 2016 ACM SIGSOFT Impact Award, the 2017 ACM SIGSOFT Outstanding Researcher Award, and is an ACM Fellow. His research currently focuses on a new approach to software design, on new programming paradigms, on cybersecurity, and on new architectures for safety in self-driving cars.



**Prof. Chang-Fu Kuo**

Director, Department of Rheumatology, Allergy and Immunology  
 Director, Medical Research and Development  
 Chang Gung Memorial Hospital (CGMH)  
 Taiwan

**Designing a Workable AI-enabled Clinical Process: CGMH Experiences**

**Abstract**

Many AI products for clinical services are approved nowadays. Despite the potential benefits of these products, the smooth integration of AI products into existing clinical practice is a main issue to help physicians without the disruption of routine clinical processes. Chang Gung Memorial Hospital has introduced several medical AI applications and met unforeseen obstacles, from the trust of clinicians to legal challenges. We took an interdisciplinary approach to design workable AI-enabled process. This talk focuses on the experiences and proposes some general advice.

**Biography**

Dr Kuo is a senior rheumatologist and currently hold the posts of director of medical research and development department, director of the division of rheumatology, allergy and immunology and director of the center for artificial intelligence in Medicine. He received his MD and Master degree in Chang Gung University and PhD in the University of Nottingham, UK. His research interests involve epidemiology of rheumatic diseases, genetic epidemiology of common complex diseases, pharmacoepidemiology and recently involves medical artificial intelligence. His research emphasizes on gout and published papers ranging from epidemiology parameters, treatment, prognosis, comorbidities, genetics and risk factors. Recently, he designed several new models to assess the drug-drug interaction using routinely collected data. He has authored over 50 scientific papers and many of which are published in high-impact journal such as JAMA and JAMA internal medicine. These achievements led to the granting of honorary associate professor by the University of Nottingham.



**Prof. Gerd Kortuem**

Co-Director, Knowledge and Intelligence Design Lab  
 Professor, Industrial Design Engineering  
 Delft University of Technology (TU Delft)  
 The Netherlands

**How to Talk with a Designer about AI**

**Abstract**

Artificial Intelligence has taken on a defining role in society. It affects what news we read online, how traffic is routed throughout a city and how we relate to each other. Designers are increasingly asked to shape the development of AI-based products/services/systems and inject their unique viewpoint to ensure that Artificial Intelligence technology is used to benefit people and society. However, traditional design education has been slow in responding to this challenge.

In this talk I will reflect on my experience about teaching digital technologies, the Internet of Things and AI as a computer scientist to design students and explore future directions for design education.

**Biography**

Gerd Kortuem is co-director of the Knowledge and Intelligence Design lab and Professor of Internet of Things at the Industrial Design Engineering Faculty at TU Delft. His research centres on the intersection of the Internet of Things, Artificial Intelligence and Design, and explores how data and smart algorithms can be used as creative design materials for solving key societal issues. He is a principle investigator at the Amsterdam Institute for Advanced Metropolitan Solutions (<https://www.ams-institute.org>) where he leads an initiative to apply design-oriented approaches to tackle ethical aspects of smart city data and algorithms. Prof Kortuem holds a PhD in Computer Science and currently serves as editorial board member of IEEE Pervasive Computing and the Springer Series in Adaptive Environments. His Smart City MOOC can be found at <https://www.futurelearn.com/courses/smart-cities>.



**Mark Wee**  
Executive Director  
DesignSingapore Council (Dsg)  
Singapore

### Design-led Technological Innovation

#### Abstract

We are living in an age where technology is disrupting the status quo at an alarming rate. Yet at the same time, many of these emerging technologies fail to reconcile practical functionality and the wider implications within their complementary ecosystem. Technological innovations alone, cannot be the answer and should not be the solution in itself. Businesses must strive towards innovation that are not only technologically-feasible, but also business-viable and market-desirable. Successful companies who have been able to strike that fine balance are those who choose to innovate using a design-led approach. What exactly does it take to be design-led and why is it so important for innovation?

Hear from Mark Wee, Executive Director, DesignSingapore Council, who will share more about the changing design and technology landscape and how organisations can leverage on a design-led approach to unlock business innovation.

#### Biography

Mark joined the DesignSingapore Council (Dsg) as Executive Director on 14 May 2018. He leads the Council in driving and implementing national policies on design as Dsg continues on its Design 2025 journey—which is to make Singapore an innovation-driven economy and a loveable city, by design.

A design veteran with wide industry connections, Mark has brought the work of the Council to the attention of global design leaders via platforms such as Brainstorm Design, Milan Design Week and the International Architecture Exhibition (La Biennale di Venezia). This has laid the groundwork for the Council's upcoming plans to grow the Singapore Design Brand more aggressively overseas.

A respected experience designer, Mark is frequently invited to speak at design events. He aims to use these opportunities to deepen the conversation on defining good design for the Singapore context in 2019.

Mr Wee is a design thinking pioneer in Singapore, having designed award-winning innovative experiences for the public and private sector. An award-winning architect, Mark was recognised by the Urban Redevelopment Authority in 2017 as the top 20 Under 45 architects in Singapore that would define the next generation.



**Pey Kin-Leong**  
Associate Provost, Undergraduate Studies  
Associate Provost, SUTD Academy  
Singapore University of Technology and Design (SUTD)  
Singapore

### How SUTD incorporates Design and AI into its Undergraduate Programme and Growth Sectors

#### Abstract

Design has been the key foundation cutting across all pillars at the SUTD undergraduate programme since its inception. AI was strategically identified as another important foundation of the UG programme in 2015/16. Since then, all students are required to take courses in data science, data analytics and AI as part of their graduation requirements. About 2 years ago, an AI minor was offered at the university level for all students to further strengthen SUTD's position in Design and AI. To further enhance the synergy between Design and AI, a new BSc degree programme focusing on using AI tools for better Design will be launched in AY2020. The verticals of such applications include the key growth areas of SUTD in Cities and Healthcare. We believe that by having a very holistic approach in strategically integrating AI into better Design, a "better world by design approach" can be used to better contributed by solving and tackling the 21st century big issues.

#### Biography

Kin-Leong Pey is currently the Associate Provost (Undergraduate Studies) and the Kwan Im Thong Hood Cho Temple Chair Professor in Healthcare Engineering at SUTD. Kin-Leong was appointed by the Singapore Ministry of Education to take up the current SUTD position in 2010. Kin-Leong is a senior member of IEEE, a Fellow of the ASEAN Academy of Engineering & Technology and Institute of Engineer, Singapore. He has been an Editor of IEEE Transactions on Devices and Materials Reliability since 2008. Kin-Leong has published 209 international refereed publications, 223 technical papers at international meetings/conferences and 7 book chapters and holds 39 US patents. Kin-Leong was recognized by the IEEE International Integrated Reliability Workshop (IIRW) as one of the top 20 experts of the FrontEnd device reliability (<http://www.iirw.org/ref/reliabilityexperts.html>) in 2018.

Kin-Leong received a Public Administration Medal (Silver), National Day Awards in 2016.

Day 3 : Wednesday, 15 January @SUTD Venue: SUTD, 8 Somapah Road, Singapore 487372		
	08:00	Arrival + Breakfast (provided)
Session III Chair: Prof Sun Lingyun	09:00	Deep-learning Electromagnetic Integrity Design for High-Density Integrated Circuits By Prof. Li Erping (ZJU)
	09:20	Rolling in the Deep (Tech): What is the Clinician's Role? By Dr Tan Teck Jack (TeleMedC Group, Northeast Medical Group)
	09:40	The Second Digital Transformation and Emerging Spatial Design Praxis By Assoc / Prof. Takehiko Nagakura (MIT)
	10:00	Multi-Disciplinary AI research for Urban Science and Real Time Mapping By Assoc / Prof. Miho Mazereeuw (MIT)
	10:20	Smarter HDB Towns, Better Living – Making AI Work For Us By Er. Dr. Johnny Wong (HDB)
	10:40	Break (refreshment provided)
	11:00	Autonomous Enterprise: Ignite the Fusion of Innovations By Dr James Ong (AIII)
	11:20	Visual Analysis of Big Data: Trends and Challenges By Prof. Chen Wei (ZJU)
	11:40	Panel Discussion on AI-for-X Moderator: Assoc / Prof. Tony Quek (SUTD)
Lunch	12:40	Lunch (Provided)
Session IV Chair: Assoc/Prof. Tony Quek	13:40	Operationalising Sensemaking in Data for Cities of Tomorrow By Mr David Tan (ST Engineering (Electronics))
	14:00	Intelligent Manufacturing Systems: Challenges and Opportunity By Prof. Sun-Yuan Hsieh (NCKU)
	14:20	The Future of Digital Technologies By Mr George Loh (NRF)
	14:40	Future of Design Enabled by Knowledge-Driven AI and Computational Engineering By Dr Lim Keng Hui (A*STAR)
	15:00	Panel Discussion on R&D and Trends Moderator: Prof. Yeo Kiat Seng (SUTD)
	16:00	Wrap up: Concluding Remarks
	16:10	Break (refreshments provided)
	16:30	SUTD Campus Tour
	17:30	Close of Day 3

ICTD 2020



**Prof. Li Erping**

IEEE Fellow  
Changjiang-Qianren Distinguished Professor  
Zhejiang University (ZJU)  
China

**Deep-learning Electromagnetic Integrity Design for High-Density Integrated Circuits**

**Abstract**

The rapid growth and convergence of digital computing and wireless communications have been driving semiconductor technology to continue its evolution following Moore's law in today's nanometer regime. Modern electronic systems integrate more complex components and devices which results in a very complex electromagnetic field environment. Electromagnetic integrity design becomes crucial issue in high performance integrated circuit (IC) design particular in 3D integrated circuits and its packaging. With the semiconductor processes technology emerging below 5nm, there must consider the overall electromagnetic integrity rather EMI, SI and PI separately. The electromagnetic integrity become correlated the major design obstacle. This talk will cover the IC electromagnetic integrity modeling, design, and analysis approaches.

**Biography**

Li Erping holds the appointment of Changjiang-Qianren Distinguished Professor in Zhejiang University, China, Dean for Zhejiang University-UIUC Institute since April 2016. He authored or co-authored over 500 papers published in the referred international journals and conferences, authored two books published at John-Wiley Press(2012) and Cambridge University Press(2014). Dr Li is a Fellow of IEEE(2007), and a Fellow of MIT Electromagnetics Academy, USA. He received numerous international awards including the IEEE EMC Richard Stoddard Award in 2015, IEEE EMC Technical Achievement Award, and Changjiang Scholr Chair Professorship(2006) from the Ministry of Education in China. He has served as General Chair and Technical Program Chair for more than 20 prestigious international conferences and delivered over 100 invited talks and plenary speeches at various international conferences and forums.



**Dr. Tan Teck Jack**

Director & Chief Medical Officer, TeleMedC Group  
 Founder & Medical Director, Northeast Medical Group  
 Singapore

**Rolling in the Deep (Tech): What is the Clinician's Role?**

**Abstract**

Medical Schools train many clinicians & discover the occasional scientists. Traditionally, innovation, technology and entrepreneurship were not encouraged, fearing a compromise in clinical acumen and strict protocols required for good medical practice.

The practice of modern medicine has evolved rapidly alongside the IT revolution, more specifically the advent of internet and democratization of information. It is often quoted that amount of health information doubles every 73 days. Medical universities around the globe are scrambling to equip their students with relevant skills rather than existing knowledge. Future doctors need soft skills for effective communication on tele-platforms, and also technical skills to manage huge amounts of patient data to optimise patient outcomes.

The clinician's interests have never been more aligned with his engineering counterparts. Both engineers and doctors have this unprecedented greenfield of opportunity where "med meets tech"; each recognising diverse interactions between interpretation and practice, and balancing biases exerted by both parties to achieve great designs.

**Biography**

Dr Tan is the Director and Chief Medical Officer of TeleMedC, a deep tech company with a global mission to deliver primary eye care especially in rural and remote populations using proprietary hardware and software solutions.

Being the founding director of Northeast Medical Group, he practises in areas of Family and Community Medicine for more than 20 years. His track record includes leading several public-private partnerships with the government; and achieving a successful public listing for his medical logistics company.

At other times, Dr Tan is active in various clinical, research and ethics committees in the Ministry of Health, hospitals, universities and a healthcare co-operative. He contributes regularly to education, media events and serves at a crisis-relief organisation. And yes, his all-doctor-all-rock band is available to play at selected charity events.



**Prof. Takehiko Nagakura**

Associate Professor, Computer Aided Design  
 Massachusetts Institute of Technology (MIT)  
 USA

**The Second Digital Transformation and Emerging Spatial Design Praxis**

**Abstract**

Practice of spatial design and representation is going through the second digital transformation. In 1990s, availability of modeling and rendering software enabled computation of geometry, materiality and light, and designers and film-makers started crafting spatial visualizations with a new level of formal complexity and photorealism in images and animations. In architectural offices, traditional drawings, scale models, and photos were amended and replaced by the new digital tools.

Over the last decade, we are witnessing the second transformation with expanding set of tools and resource. In visualization, cities are scanned into virtual forms and distributed by Google Earth, and instantly consumed by the mass. Online real estate ads come in interactive tour format produced by portable LiDAR and game engine software. In modeling, traditional drafting and geometric modeling process is taken over by information modeling in BIM. Urban designs are experimented through data-driven approach and machine learning applications.

The second transformation has invited new diverse players to design industry at a more fundamental level of design process, and potentially leads to a transformation beyond altering the tools, to that of the methods of design and designers themselves. In this speech, Nagakura presents the emerging spatial design research and praxis with his recent projects and those of his students at MIT as examples.

**Biography**

Nagakura is an architect from Tokyo. At MIT, he teaches courses related computer-aided design, and his research focuses on the representation and computation of spatial design and design knowledge. His recent projects include a series of digital heritage workshops in prominent locations such as Machu Picchu, that uses photogrammetry and panoramic videos to capture and preserve historic places, as well as Arcbazar.com, an online competition platform created to democratize architectural design process through crowdsourcing, for which he works as a key advisory member.



**Prof. Miho Mazereeuw**

Associate Professor, Architecture and Urbanism  
Massachusetts Institute of Technology (MIT)  
USA

**RiskMap Project - Multi-Disciplinary AI research for Real Time Mapping**

**Abstract**

This presentation will share the multi-disciplinary RiskMap project and the AI research that is being conducted at the Urban Risk Lab at MIT. This platform connects residents, who often have the best localized information with emergency managers to drastically cut down on response times during a crisis. Through the live map, residents are also able to inform each other about dynamically changing situations in the city and help each other navigate to safety. The on-going AI component of the project aims to rank, prioritize and verify data being submitted in the real-time mapping platform. The machine learning algorithms help to handle the large volumes data and to classify them.

**Biography**

Miho Mazereeuw is an Associate Professor of Architecture and Urbanism at the School of Architecture and Planning at MIT, and the director of the Urban Risk Lab at MIT. Her research focuses on preparing communities for climate and seismic disasters. Mazereeuw taught at the Graduate School of Design at Harvard University, the University of Toronto and worked as an associate at OMA prior to joining the faculty at Massachusetts Institute of Technology. The Urban Risk Lab engages in action research through extensive field work and community workshops to focus on the needs of diverse cultures and contexts. With a global network of partners, the Lab is a place to innovate on prototypes, techniques, processes, and systems to address the complexities of seismic, climatic, and hydrologic risks. The Lab aspires to change the course of current global development trends through a radical shift in education and action to proactively embed preparedness and risk reduction in this rapidly urbanizing world.



**Er. Dr. Johnny Wong**

Group Director  
Building & Research Institute HDB  
Chief Technology Officer/Senior Director, (Research & Development)  
Ministry of National Development  
Singapore

**Smarter HDB Towns, Better Living – Making AI Work For Us**

**Abstract**

As the master planner and developer of Singapore’s public housing estates, the Housing & Development Board (HDB) is constantly on the lookout for innovative technologies to provide a more liveable environment for our residents. Advancement in technology has allowed HDB to capitalise on artificial intelligence (AI) to impact almost every aspect of how we live, work, play and learn, and how we plan and design our towns. In line with Singapore’s National AI Strategy and Smart Nation journey, Dr Johnny Wong will highlight key initiatives which have been instrumental in driving HDB’s R&D efforts on AI solutions. He will also be sharing possibilities on how AI technologies can be exploited in the near future to improve the planning, construction and maintenance of HDB towns to benefit our residents.

**Biography**

Er. Dr Johnny Wong, Group Director for HDB’s Building & Research Institute, is responsible for leading HDB’s efforts in spearheading solutions to create a more sustainable and better living environment. Some of the key initiatives that he has spearheaded include the formulation of the HDB Smart Town framework, deployment of solar energy systems in public housing, advanced prefabrication technology and setting of up multi-disciplinary design arm of HDB to advance design innovation and integration of advanced building technologies. Additionally, Dr Wong serves as the Chief Technology Officer/ Senior Director (R&D) in the Ministry of National Development, where he works to fulfil the Ministry’s broader goals in driving technology R&D for the Built Environment. In driving Singapore’s Smart Nation agenda, Dr Wong co-chairs an inter-agency working committee to spearhead Smart town efforts, which aims to leverage smart technologies to make HDB towns and estates more liveable, efficient, and sustainable. He is also a Board Member of the Professional Engineers Board.





**Dr. James Ong**  
Co-Founder  
Artificial Intelligence Industrial Institute (AIII)  
China

### Autonomous Enterprise: Ignite the Fusion of Innovations

#### Abstract

With all the attention and hype given to emerging and exciting technologies such as AI, Blockchain, IoT evolving from basic and application research to the industry, organizations will gradually be digitally transformed and evolve into Autonomous Enterprise, where more and more of the management processes, operation and decision making will be automated.

To ensure a sustainable flow of innovations for Autonomous Enterprise, it is thus vital to examine the ecosystem holistically, understand where and what are the key bottlenecks from basic research, application research towards technology productization, commercialization and market scaling and develop capabilities to unleash the potentials of these breakthroughs.

Furthermore, a comprehensive Fusion model designed to ignite innovations in Autonomous Enterprise will be presented such that organizations can plan strategically to understand, appreciate, explore, manage, justify and govern the adoption of these emerging technologies to reap the benefits while balancing with the necessary risk management.

#### Biography

James is an entrepreneur and community builder who has incubated, invested and mentored various technology startups in China, Singapore and USA. He has co-founded Artificial Intelligence Industrial Institute (AIII) based in Shanghai, China and actively contributes to the AI ecosystem development in China especially Shanghai and Yangtze Delta region and foster cross-border international collaboration. This includes contributions to AI standards, the World AI Conference (WAIC) SAIL Award and the Shanghai AI Development Alliance (SAIA).

James has more than 30 years of experience in the technology and strategy advisory services for digital transformation in Asia, US and Europe across multiple industry verticals. James started his career as Member of Technical Staff at Microelectronics and Computer Technology Corporation (MCC) USA where he focused on advanced research on Fifth Generation Computers including Artificial Intelligence, Deductive Databases, Knowledge Discovery and Data Mining, Distributed Systems. He received his PhD in Management Information Systems and MA & BA in Computer Science from the University of Texas at Austin with doctorate thesis on Business Process Automation with AI.



**Prof. Wei Chen**  
Professor, Computer Science  
Zhejiang University (ZJU)  
China

### Visual Analysis of Big Data: Trends and Challenges

#### Abstract

In this talk, I will briefly introduce the concept and applications of visual analysis of big data. I will explain how visual analysis may benefit AI in an interactive way, and the way it may influence the future of AI. Many examples from my team will be demonstrated.

#### Biography

Wei Chen is a professor in State Key Lab of CAD&CG at Zhejiang University, P.R.China. He has performed research in visualization and visual analysis and published more than 30 IEEE/ACM Transactions and IEEE VIS papers. His current research interests include visualization, visual analytics and bio-medical image computing. For more information, please refer to <http://www.cad.zju.edu.cn/home/chenwei>.



**David Tan**  
 Chief Technology Officer  
 ST Engineering (Electronics)  
 Singapore

### Operationalising Sensemaking in Data for Cities of Tomorrow

#### Abstract

Smart Cities of tomorrow are increasingly referred to as wired cities, digital cities or intelligent cities. Smart City Market on a global level is estimated at a huge US\$1.56 TRILLION by 2025. These cities have active plan or projects that touches on several key functional areas such as Energy, Buildings, Mobility, Technology, Infrastructure, Healthcare, Governance and Citizenry.

Every single day, these cities are also churning out gargantuan data ranging from sensors derived data from machines, equipment and buildings to citizens or customers interaction and transactions. In fact, the number of people seeking meaning out of data dwarfs the number of people supplying data. However unless harnessed for insights with contextual reasoning, these data will be lost. How does companies, start-ups, SMEs, Large Local Enterprises and Government Agencies use the power of technology in AI, Blockchain, Cloud, Data Analytics and Cyber Security to help in anticipating problems, zeroing in on opportunities and developing enterprise solutions in an eco-system approach for Smart Cities of Tomorrow?

The talk focuses on creative innovation, smart developments of technologies and operationalising Sensemaking for Cities of Tomorrow in contexts. Undergirding it shall be the concept of a data supply chain that will not suffer from a fundamental flaw in the architecture. The concept of a AI-Driven Converged Platform known as S.A.I.N.T.S ie, Smart Analytics with Insights in a Knowledge Corpus shall be distilled using Singapore as a Smart City for development.

#### Biography

David is currently the CTO of ST Engineering Electronic sector. Concurrently he champions ideas and develops translational concepts leveraging on Data Analytics, Machine Learning and Artificial Intelligence capabilities for Smart Cities such as smart airport and seaport, Homeland Security, Sensemaking, Next Generation of Cognitive C2 systems.



**Prof. Sun-Yuan Hsieh**  
 Vice President, Research and Development  
 National Cheng Kung University (NCKU)  
 Taiwan

### Intelligent Manufacturing Systems: Challenges and Opportunity

#### Abstract

Industry 4.0 emphasizes deeply on improving the productivity of production lines of industry factories, but with less emphasis on quality improvement. This makes it impossible for the factories to achieve the goal of zero defects. A major reason is lack of an effective and practical online real-time total inspection system. In this talk, an innovative Intelligent Manufacturing System (IMS) framework developed by the Intelligent Manufacturing Research Center at National Cheng Kung University (NCKU) is introduced. The IMS collects a great deal of data from base machines of factory, via IOT and networking technology. Then, with the aid of some deep learning algorithms and machine learning for big data analysis, the system can help for detecting defects in production lines. Some application by applying IMS to production lines for wheel rims, Aerospace, semiconductor, CNC machine tool, stretch blow molding, and TFT-LCD will also be demonstrated.

#### Biography

Sun-Yuan Hsieh received the PhD degree in computer science from National Taiwan University, Taipei, Taiwan, in June 1998. He then served the compulsory two-year military service. From August 2000 to January 2002, he was an assistant professor at the Department of Computer Science and Information Engineering, National Chi Nan University. In February 2002, he joined the Department of Computer Science and Information Engineering, National Cheng Kung University, and now he is a chair professor. His awards include the 2007 K. T. Lee Research Award, President's Citation Award (American Biographical Institute) in 2007, Engineering Professor Award of Chinese Institute of Engineers (Kaohsiung Branch) in 2008, National Science Council's Outstanding Research Award in 2009, IEEE Outstanding Technical Achievement Award (IEEE Tainan Section) in 2011, Outstanding Electronic Engineering Professor Award of Chinese Institute of Electrical Engineers in 2013, and Outstanding Engineering Professor Award of Chinese Institute of Engineers in 2014. He is Fellow of the British Computer Society (BCS).

Dr. Hsieh is also an experienced editor with editorial services to a number of journals, including serving as associate editors of IEEE ACCESS, IEEE Transactions on Reliability, Theoretical Computer Science (Elsevier), Discrete Applied Mathematics (Elsevier), Journal of Supercomputing (Springer), International Journal of Computer Mathematics (Taylor & Francis Group), Parallel Processing Letters (World Scientific), Discrete Mathematics, Algorithms and Applications (World Scientific), Fundamenta Informaticae (Polish Mathematical Society), and Journal of Interconnection Networks (World Scientific). In addition, he has served on organization committee and/or program committee of several dozens international conferences in computer science and computer engineering. His current research interests include design and analysis of algorithms, fault-tolerant computing, bioinformatics, parallel and distributed computing, and algorithmic graph theory.



**George Loh**

Director, Services & Digital Economy  
National Research Foundation (NRF)  
Singapore

**The Future of Digital Technologies**

**Abstract**

As the world moves towards the digital and electronic space, Singapore will be continuously and deliberately investing in developing horizontal trust technologies to maintain its economic competitive edge and to achieve the Smart Nation vision.

**Biography**

George Loh, Director (Services & Digital Economy), joined National Research Foundation in Oct 2011 and was responsible for the development of the scientific and R&D strategy as well as R&D capabilities in the local ecosystem in Singapore. In particular, he developed scientific research programmes in physical sciences & engineering and digital technology with the stakeholders in the government agencies, in the academia and the industry, which included the National Cybersecurity R&D programme, National Robotic R&D programme, Virtual Singapore Programme, Marine Science R&D programme, Synthetic Biology programme, National Quantum Engineering Programme to ensure the desired outcomes are achieved. George also worked with several global companies to establish Corp Lab @ University, which aimed to translate of research outcomes and commercialize industry-relevant technologies, thereby strengthening the link between innovation and economic growth. Prior to NRF, George Loh spent more than 20 years with Defence Science & Technology Agency.



**Dr. Lim Keng Hui**

Executive Director, Institute of High Performance Computing (IHPC)  
A\*STAR  
Singapore

**Future of Design Enabled by Knowledge-Driven AI and Computational Engineering**

**Abstract**

Computer-Aided Engineering (CAE) to simulate and virtually test product functionality and manufacturability is widely used with Computer-Aided Design (CAD) tools for design and innovation. The digital design workflow involves the human designers using and interacting with CAD and CAE tools interchangeably in an iterative loop to converge towards the optimal design.

The interaction between the designers and the CAD tools is fast but one-directional only; while the interaction between the designers and the CAE tools is often frustratingly slow as computational simulations are slow and tools not coupled. This one-directional interaction and timescale mismatch from the use of tools often interrupt and limit the design and human creative process.

This talk will present our research in coupled multi-physics modelling and simulation for CAE, and the incorporation of data-driven and knowledge-driven AI approaches to significantly speed up CAE. Our goal is to enable the designers to design, simulate and virtually test the products in near-real time. Examples will be given for industrial and urban solutions use cases. I will also discuss our work to integrate AI and automation into the design workflow, so that machines can assist and interact with the designers to maximise the human creativity.

**Biography**

Dr Lim Keng Hui is the Executive Director of the Institute of High Performance Computing (IHPC) in A\*STAR. He leads the research institute of more than 300 researchers to advance scientific knowledge, and deliver impact to the industry and society through research in computational modelling, simulation and AI. Prior to his current role, Keng Hui was the Director of the SUTD Digital Manufacturing & Design Centre (DManD), and also concurrently the Director of the National Additive Manufacturing Innovation Cluster (NAMIC@SUTD). He had previously also held key appointments in research organisations and companies in US and Singapore, and served on national-level R&D committees in digital services, advanced manufacturing, robotics and urban solutions.

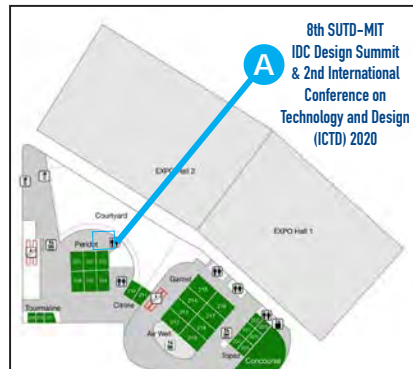




## VENUE: DAY 1 & 2

### **MAX Atria, Singapore Expo** 1 Expo Drive, Singapore 486150

#### Location Map



Legend:

A - Level 2, Peridot 202 & 203

Credit: MAX Atria

#### By MRT

A direct, more convenient way to arrive at Singapore EXPO is through the Downtown Line. It now takes only 30 minutes from CBD areas such as Clarke Quay, Marina Bay and River Valley. If you are coming from other parts of Singapore, transfer at Tanah Merah MRT Station (EW4), from there the train will take you to Expo MRT in 3 minutes.

#### By Taxi

There are numerous taxis available in Singapore that offer reliable service. The taxi fare from the airport to MAX Atria is about S\$15 and to the city about S\$20, subject to surcharges.

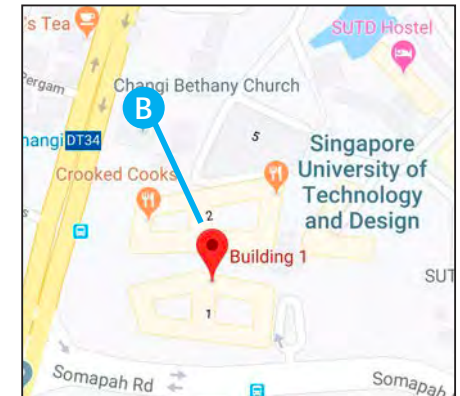
#### By Car

Situated at the crossroads of 3 main expressways — East Coast Parkway, Pan Island Expressway and Tampines Expressway, MAX Atria is a mere 15-minute drive from the CBD and a 5-minute ride to Changi International Airport.

## VENUE: DAY 3

### **Singapore University of Technology and Design (SUTD)** 8 Somapah Road, Singapore 487372

#### Location Map



Legend:

B - Lecture Theatre 2,  
Building 1, Level 3 (1.318)

Credit: Google Map

#### By MRT

Alight at Upper Changi MRT Station (DT34) and take Exit B — our campus will be on your left when you exit the station.

Alight at Expo MRT Station (DT35 / CG1) and walk to our campus — along Changi South Avenue 1 in the direction of Max Pavilion/Somapah Road

#### By Bus

Alight at one of the bus stops along Somapah Road and walk to our Campus:

B96449: SUTD. Service No: 20

B96441: Opposite SUTD. Service No: 20

Alight at one of the bus stops along

Upper Changi Road East and walk to our Campus:

B96041: Upper Changi Road East, Before Tropicana Condo. Service No: 2, 5, 24

B96049: Upper Changi Road East, Opposite Tropicana Condo. Service No: 2, 5, 24

Alight at Changi Business Park Bus Terminal and walk to our Campus: Service No: 47, 118

#### By Car

From ECP:

- Take Exit 2B on ECP (Xilin Ave towards Tampines)
- Turn right to Changi South Ave 1
- Turn left into the Campus carpark (before the sports complex),
- after the traffic junction of Somapah Road and Changi South Ave 1

From PIE:

- Take Exit 4A on PIE (Simei Ave)
- Turn left to Upper Changi Road East
- Turn right to Somapah Road
- Turn left to Changi South Ave 1
- Turn left into the Campus carpark (before the sports complex)

