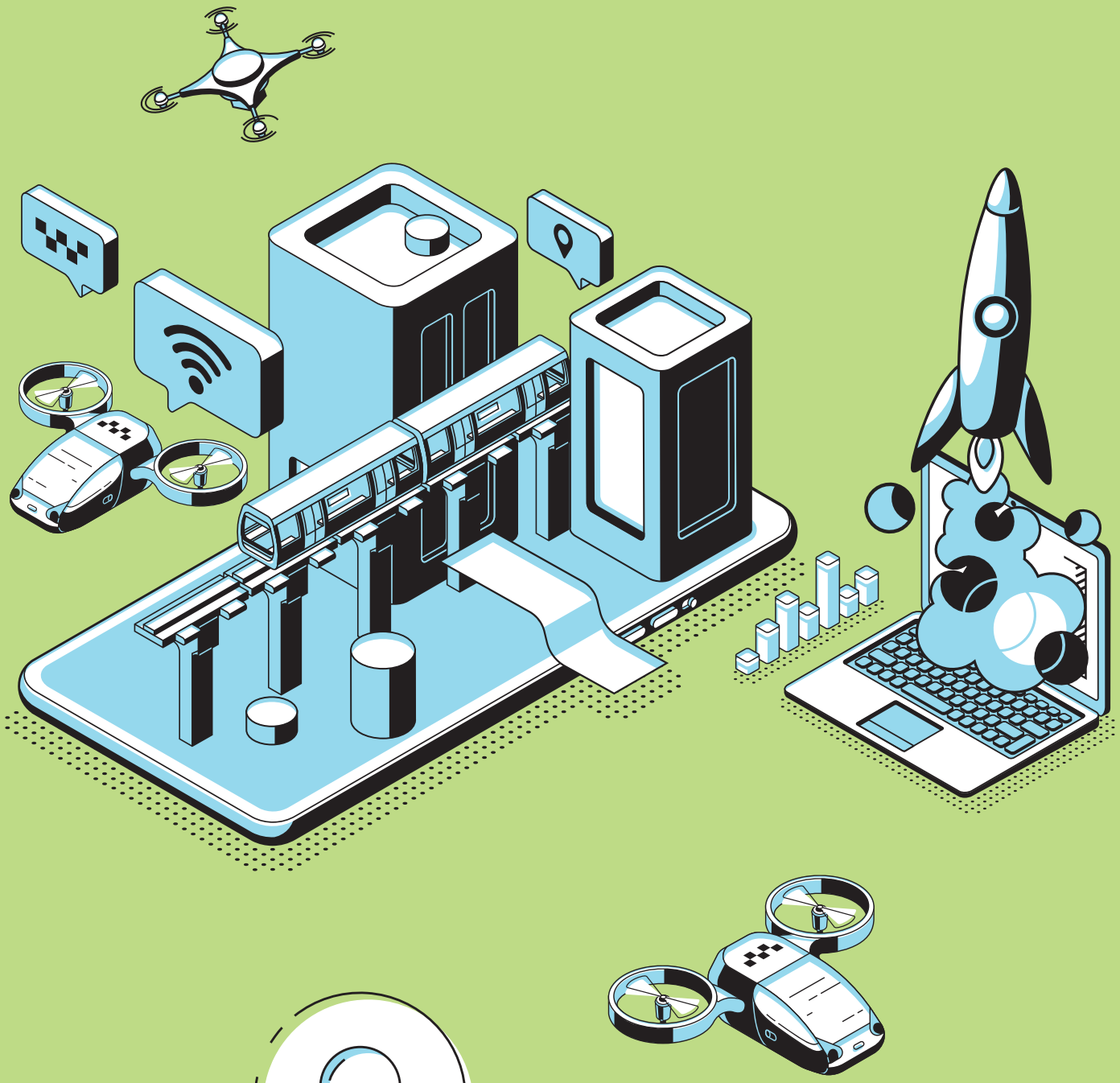
INNOVATION,
PATENTS AND
BEYOND
創新創意 盡在其中

香港中文大學
The Chinese University of Hong Kong



23 September 2021 (Thu)
2021年9月23日 (星期四)

CUHK 中大創新日 | 20
INNOVATION DAY | 21

Quick Facts on CUHK Innovation

QS World University Rankings 2022[1]:

39

MOST INNOVATIVE

University in Hong Kong[2]

Ranked 26 in Asia Pacific's Most Innovative Universities 2019

TOP 100

worldwide universities granted U.S. utility patents[3]

74%

CUHK research rated as world leading or internationally excellent[4]

MOST PATENTS GRANTED UNIVERSITY[5]

in 3 consecutive years

In 2020/21

- **386** Patents filed
- **226** Patents granted
- **80** Licences granted

Total number to date

- **3374** Patents filed
- **1386** Patents granted
- **926** Inventions

62

Tech Start-up Companies

established under the Technology Start-up Support Scheme for Universities (TSSSU) since 2014

113

Student Start-up Projects

established under PI Centre since 2014

16

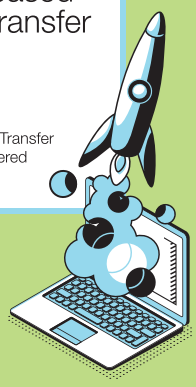
Social Enterprises

Supported by Sustainable Knowledge Transfer Project Fund (S-KPF), a one-of-a-kind funding program in Hong Kong since 2015

226

Community-based Knowledge Transfer Projects

supported by Knowledge Transfer Project Fund (KPF), pioneered by CUHK since 2009



1: https://www.topuniversities.com/university-rankings/world-university-rankings/2022
2: https://graphics.reuters.com/ASIA-UNIVERSITY-INNOVATION/0100B02G03Z/index.html
3: https://academyofinventors.org/top-100/
4: According to Research Assessment Exercise 2020
5: Since 2017/18

Opening Session

@CUHK InnoPort

10:00 – 10:10	**Opening Speech** · Mr. Alfred SIT, JP, Secretary, Innovation and Technology Bureau, HKSAR · Prof. Rocky TUAN, Vice-Chancellor and President, CUHK
10:10 – 10:35	**Kick-off Ceremony of Innovation Day** · Mr. Alfred SIT, JP, Secretary, Innovation and Technology Bureau, HKSAR · Prof. Rocky TUAN, Vice-Chancellor and President, CUHK · Prof. Alan CHAN, Provost, CUHK · Prof. Mai Har SHAM, Pro-Vice-Chancellor and Vice-President, CUHK · Prof. Benny ZEE, Director, Office of Research and Knowledge Transfer Services, CUHK
10:35 – 12:30	**Exhibition Tour**

Thematic Session

@CUHK Yasumoto International Academic Park

Emerging Technologies in CUHK

14:00-14:05	**Welcome Remarks** · Prof. Mai Har SHAM, Pro-Vice-Chancellor, CUHK
14:05-14:25	**Satellite and Mobile Sensing Technologies and Applications: A New Angle to Promote Public Health Infrastructure** · Prof. Mei Po KWAN, Director, Institute of Space and Earth Information Science, CUHK
14:25-14:45	**Green Energy and Advanced Material Research** · Prof. Chunshan SONG, Dean, Faculty of Science, CUHK
14:45-15:15	**Tissue Engineering and Regenerative Medicine Development** · Prof. Hon Fai CHAN, Assistant Professor, Institute for Tissue Engineering and Regenerative Medicine (iTERM), CUHK · Prof. Anna BLOCKI, Assistant Professor, Institute for Tissue Engineering and Regenerative Medicine (iTERM), CUHK · Prof. Michelle WANG, Research Assistant Professor, Institute for Tissue Engineering and Regenerative Medicine (iTERM), CUHK
15:15-15:45	**Industry Insights: NEC's Research and the Future Demand of Technologies** · Ms. Elsa WONG, Managing Director, NEC Hong Kong
15:45-16:00	**Intermission**
16:00-16:30	**Panel Discussion: The Advantages of Future CUHK Satellite** · Ms. Elsa WONG, Managing Director, NEC Hong Kong · Prof. Alan CHAN, Provost, CUHK · Prof. Mei Po KWAN, Director, Institute of Space and Earth Information Science, CUHK · Prof. Peifeng MA, Research Assistant Professor, Institute of Space and Earth Information Science, CUHK · Moderator: Prof. Benny ZEE, Director, Office of Research and Knowledge Transfer Services, CUHK
16:30-16:50	**Laser-based Gas Sensing: Integrating Upstream Knowledge in Downstream Applications** · Prof. Wei REN, Associate Professor, Faculty of Engineering, CUHK
16:50-17:10	**Strategies to Enhance Early Language Development** · Prof. Patrick WONG, Director, Brain and Mind Institute, CUHK
17:10-17:15	**Closing Remarks** · Prof. Benny ZEE, Director, Office of Research and Knowledge Transfer Services, CUHK

Officiating Guests (Listed in order of appearance)

Mr. Alfred SIT, JP

Secretary, Innovation and Technology Bureau, HKSAR

Mr. Alfred SIT is the current Secretary for Innovation and Technology. Mr. SIT is an electrical engineer by profession and has over 30 years' experience in public administration. He is a fellow member of the Hong Kong Institution of Engineers. He was the President of the Hong Kong Institution of Facility Management and Chairman of the Biomedical Division of the Hong Kong Institution of Engineers.

Mr. SIT joined the Government as an Assistant Electrical and Mechanical Engineer in 1984 and was promoted to Chief Electrical and Mechanical Engineer in 2001, to Government Electrical and Mechanical Engineer in 2007 and to Deputy Director of Electrical and Mechanical Services in 2011. From October 2017, he was the Director of Electrical and Mechanical Services and Electrical and the Mechanical Services Trading Fund General Manager. On 22 April 2020, Mr. SIT was appointed as the Secretary for Innovation and Technology.

Mr. SIT holds an Associateship in Electrical Engineering from the Hong Kong Polytechnic and a master degree in Business Administration from The Chinese University of Hong Kong. He has also attended Harvard Business School.

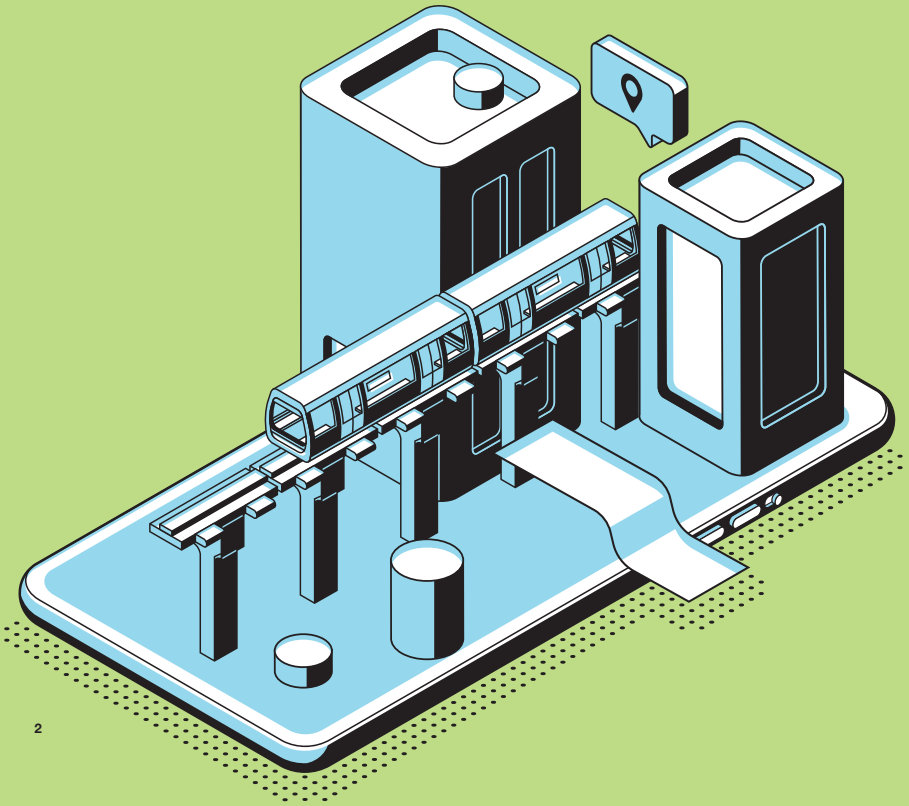
Prof. Rocky TUAN

Vice-Chancellor and President,
Lee Quo Wei and Lee Yick Hoi Lun Professor of Tissue Engineering and Regenerative Medicine, CUHK

Prof. Rocky S. TUAN began his term as the eighth Vice-Chancellor and President of The Chinese University of Hong Kong (CUHK) on 1 January 2018. Born and raised in Hong Kong, he pursued further studies in the United States and received his PhD in Life Sciences in 1977 from the Rockefeller University in New York.

Prof. TUAN is an internationally renowned biomedical scientist specializing in musculoskeletal biology and tissue regeneration, whose work covers both basic science and engineering, as well as translational and clinical applications. Prior to joining CUHK in 2016 as a distinguished visiting professor and the founding director of the Institute for Tissue Engineering and Regenerative Medicine, he was a distinguished professor of orthopaedic surgery and the director of the Center for Cellular and Molecular Engineering in the School of Medicine at the University of Pittsburgh.

In 2017, 2018, 2019 and 2021, Prof. TUAN was elected to the fellowships of the National Academy of Inventors (NAI), the Chinese Association of Inventions (CAI), the American Association of Anatomists (AAA), and the Orthopaedic Research Society (ORS), respectively, for his accomplishments in innovation and translational research that bring significant impact on society.



Prof. Alan CHAN

Provost, J.S. Lee Professor of Chinese Culture, CUHK

Prof. Alan CHAN is currently the Provost and J.S. Lee Professor of Chinese Culture at The Chinese University of Hong Kong (CUHK). Prior to joining CUHK, Prof. Chan was Toh Puan Mahani Idris Daim Chair Professor of Humanities at the Nanyang Technological University (NTU) of Singapore. He joined NTU as Dean of the College of Humanities, Arts, and Social Sciences, and Professor of Philosophy in 2009. In January 2018, Prof. CHAN was appointed Vice President of NTU, responsible for alumni engagement, university advancement and international relations.

Prof. CHAN was born in Hong Kong and completed his secondary school education here. He then pursued his higher education in Canada. He received his BA from the University of Winnipeg, MA from the University of Manitoba, and PhD in religious studies from the University of Toronto. Prof. CHAN began his academic career as an assistant professor at the University of Manitoba. He then joined the National University of Singapore (NUS), where he held several leadership roles, including the Vice-Dean of the Faculty of Arts and Social Sciences, and Associate Provost (Undergraduate Education). While at NUS, Prof. CHAN twice received the Teaching Excellence Award.

Prof. Mai Har SHAM

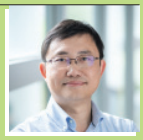
Pro-Vice-Chancellor and Vice-President, Choh-Ming Li Professor of Biomedical Sciences, CUHK

Prof. Mai Har SHAM is a Pro-Vice-Chancellor of The Chinese University of Hong Kong (CUHK) and Choh-Ming Li Professor of Biomedical Sciences. Prof. SHAM obtained her BSc and MPhil degrees in Biology at CUHK. She was awarded a Croucher Foundation Scholarship and pursued her PhD in Biochemistry in the University of Cambridge. She received her postdoctoral training in Developmental Genetics in the National Institute for Medical Research in London, U.K. Prof. SHAM joined the University of Hong Kong as a lecturer and progressed to full professor. She headed the Department of Biochemistry, where she promoted not only excellent research, but also good practice in teaching. She was dedicated to medical and science curriculum development, she led the design and establishment of the first Bachelor of Biomedical Sciences curriculum in Hong Kong.

Prof. SHAM has extensive experience in research management and leadership. In her previous roles as Assistant Dean (Research) and Associate Vice-President (Research) in the University of Hong Kong, she contributed to research grant management, research assessment exercises, strategic development of research and collaborations with international and mainland China institutions. She facilitated the development of research postgraduate education and joint PhD supervision programmes with partner institutions. Prof. SHAM is a member of the World Conference on Research Integrity Foundation. Working together with the international consortium, she promotes responsible conduct of research and good science in universities and research institutions.

Prof. Benny ZEE

Director, Office of Research and Knowledge Transfer Services, CUHK



Prof. Benny ZEE is Director, Office of Research and Knowledge Transfer Services (ORKTS) of The Chinese University of Hong Kong (CUHK). He is also Professor and Director of the Centre for Clinical Research and Biostatistics (CCRB) of the Jockey Club School of Public Health and Primary Care, and Director of Clinical Trials and Biostatistics Lab in the CU Shenzhen Research Institute (SZRI). He holds honorary appointments in the Department of Clinical Oncology and the Department of Statistics of CUHK. He is also the Chairman of the Joint CUHK-NTEC Clinical Research Ethics Committee from 2006-2020. Prof. ZEE obtained his PhD in Biostatistics from the University of Pittsburgh in 1987. He then joined the National Cancer Institute of Canada Clinical Trials Group as Senior Biostatistician, and faculty member in the Department of Community Health and Epidemiology and the Department of Mathematics and Statistics of Queen's University Canada from 1987-2001. He remains as Adjunct Professor with Queen's University after he joined CUHK and is actively promoting international academic activities and collaborations.

Speaker's Profile (Listed in order of appearance)

Prof. Mei Po KWAN
Director
Institute of Space and
Earth Information Science
The Chinese University of Hong Kong

Prof. Mei Po KWAN is the Director of the Institute of Space and Earth Information Science of The Chinese University of Hong Kong, Choh-Ming Li Professor of Geography and Resource Management of The Chinese University of Hong Kong, and Affiliated Professor in the Department of Geography and Geographic Information Science of the University of Illinois Urbana-Champaign. Prof. KWAN is a Fellow of the United Kingdom Academy of Social Sciences, Fellow of the American Association for the Advancement of Science (AAAS), Fellow of the Royal Geographical Society and American Association of Geographers. She was awarded many Outstanding Academic Achievement Awards by the American Association of Geographers, including the Distinguished Scholarship Honors, the Edward L. Ullman Award for Outstanding Contributions to Transportation Geography, and the Melinda Meade Award for Outstanding Contributions to Health and Medical Research. She also received the U.S. University Consortium for Geographic Information Science (UCGIS) Research Award.

Prof. Chunshan SONG
Dean, Faculty of Science
The Chinese University of Hong Kong

Prof. Chunshan SONG is the Dean of Science and Wei Lun Professor of Chemistry at The Chinese University of Hong Kong since July 2020. He was Director of the Energy Institute and a Distinguished Professor in Fuel Science and Chemical Engineering at the Pennsylvania State University in the US and the founding Director of US DOE University Coalition for Fossil Energy Research consisting of 15 major research universities until June 2020. His research interests focus on chemistry and catalysis for energy and fuels including CO2 separation and CO2 conversion to chemicals and fuels; adsorptive, oxidative and catalytic processing of fuels; shape-selective catalysis; energy conversion; synthesis and application of nano-structured materials. He received BS in chemical engineering from Dalian University of Technology in China, MS and PhD in applied chemistry from Osaka University in Japan. He has 440 refereed publications (with 35,200 citations and H-index of 87 in Google Scholar, Sept 2021), 8 patents, and 15 edited books. He is a Fellow of American Chemical Society, and has received ACS George A. Olah Award, ACS Henry H. Storch Award; ACS Energy & Fuels Division's Distinguished Researcher Award; Fulbright Distinguished Scholar; Herman Pines Award from Catalysis Club of Chicago; Catalysis Club of Philadelphia Award; Top Cited Author in Catalysis from Elsevier; Most Cited Author in Energy Science & Engineering and in Chemical Engineering, Global Alumni Fellow of Osaka University, and within Penn State, the Faculty Scholar Medal, Distinguished Professor, and Wilson Award for Excellence in Research.

Prof. Hon Fai CHAN
Assistant Professor
Institute for Tissue Engineering and
Regenerative Medicine (iTERM)
The Chinese University of Hong Kong

Prof. CHAN Hon Fai is an Assistant Professor at the Institute for Tissue Engineering and Regenerative Medicine (iTERM) and School of Biomedical Sciences at The Chinese University of Hong Kong. He received his B.Eng. degree from The University of Hong Kong. He then pursued his M.S. and Ph.D. degree at Duke University. During his Ph.D. training, he focused on developing several microfluidic technologies to perform 3D spheroid culture, and investigated the effect of supplementing extracellular matrix cues on spheroid functions. Afterward, Prof. CHAN joined Massachusetts Institute of Technology as a postdoctoral associate. There he conducted organ-on-a-chip research and developed biomaterial scaffold to recapitulate tissue folding. His current research focuses on organ-on-a-chip and microfabrication approach for tissue engineering.

Prof. Anna BLOCKI
Assistant Professor
Institute for Tissue Engineering and
Regenerative Medicine (iTERM)
The Chinese University of Hong Kong

Prof. Anna BLOCKI, PhD, has joined the Chinese University of Hong Kong (CUHK) since February 2018 as an Assistant Professor at the Institute for Tissue Engineering and Regenerative Medicine (iTERM) and School of Biomedical Sciences (SBS). Her current work focuses on developing innovative approaches to modulate diseased microenvironments and guide healing and regenerative processes. Prof. BLOCKI received her PhD from the National University of Singapore (NUS) in 2013. Following that, she carried out her first postdoctoral appointment at the Agency for Science Technology and Research (A*STAR), Singapore. In 2015, Prof. BLOCKI was able to secure a competitive postdoctoral fellowship from the Charité Universitätsklinikum Berlin, where she worked before joining CUHK.

Prof. Michelle WANG
Research Assistant Professor
Institute for Tissue Engineering and
Regenerative Medicine (iTERM)
The Chinese University of Hong Kong

Prof. Michelle WANG completed her B.S and M.S in Dental Medicine from Sun Yat-Sen Medical University, Ph.D. in Oral Biology from the Dental School of University of Pittsburgh, and her postdoctoral training from the Department of Orthopaedic Surgery at Stanford University. Prof. Wang has interdisciplinary training, including basic and pre-clinical research and a current medical practice. These diverse perspectives have informed her approach to expanding the frontiers of biomedical knowledge and advanced patient care.

During her doctoral training, Prof. WANG secured a Ph.D. scholarship from the University of Pittsburgh and studied the contributions of Toll-Like Receptors (TLRs) to skull bone healing in various clinically relevant animal models. This work has received recognition in the form of a Student Research Award from the American Association for Dental Research. During her postdoctoral research at Stanford University, Prof. WANG identified genes responsible for rapid bone growth and differentiation in deer antler regeneration, and research received widespread media coverage for this research. Prof. WANG also developed a phototunable polyurethane biomaterial for bone-to-tendon repair, which is currently under further pre-clinical development. In her current research program at CUHK, Prof. WANG and her team are focused on elucidating the contributions of extracellular matrix (ECM) components within the stem cell microenvironment and applying such knowledge towards the engineering of novel biomaterials for musculoskeletal tissue repair. Prof. WANG has obtained numerous local and national research support and her work has been published in prestigious journals such as Advanced Functional Materials, Biomaterials, Nature Publishing Group Asia Materials, Stem Cell Research & Therapy, and had been featured in several books.

Ms. Elsa WONG
Managing Director
NEC Hong Kong Limited

Ms. Elsa WONG is Managing Director and Board of Director of NEC Hong Kong Limited (NECHK), a leading Japanese based technology company providing one-stop solutions/services for various industries in Hong Kong, Macau and the Greater Bay Area.

Ms. WONG has been working for NECHK for more than 22 years and was promoted through the ranks to Managing Director and the Global Head of "Centre of Excellence" for Smart Transportation. NECHK won Hong Kong's Most Valuable Companies Award in the "Most Reliable Biometrics Solutions Provider" category and won the Leaders of Innovation awards in 2019.

Ms. WONG is a Robotic Engineer and holds a Master degree in Computer Science. She has led innovation within the Hong Kong team at NEC to create several patents for the Company.

Prof. Alan CHAN
Provost
J.S. Lee Professor of Chinese Culture, CUHK

Prof. Alan CHAN is currently the Provost and J.S. Lee Professor of Chinese Culture at The Chinese University of Hong Kong (CUHK). Prior to joining CUHK, Prof. Chan was Toh Puan Mahani Idris Daim Chair Professor of Humanities at the Nanyang Technological University (NTU) of Singapore. He joined NTU as Dean of the College of Humanities, Arts, and Social Sciences, and Professor of Philosophy in 2009. In January 2018, Prof. CHAN was appointed Vice President of NTU, responsible for alumni engagement, university advancement and international relations.

Prof. CHAN was born in Hong Kong and completed his secondary school education here. He then pursued his higher education in Canada. He received his BA from the University of Winnipeg, MA from the University of Manitoba, and PhD in religious studies from the University of Toronto. Prof. CHAN began his academic career as an assistant professor at the University of Manitoba. He then joined the National University of Singapore (NUS), where he held several leadership roles, including the Vice-Dean of the Faculty of Arts and Social Sciences, and Associate Provost (Undergraduate Education). While at NUS, Prof. CHAN twice received the Teaching Excellence Award.

Prof. Peifeng MA
Research Assistant Professor
Institute of Space and
Earth Information Science
The Chinese University of Hong Kong

Prof. Peifeng MA is a Research Assistant Professor at the Institute of Space and Earth Information Science, The Chinese University of Hong Kong. He has published more than 30 research articles in international journals and obtained 12 patents. His interests include radar remote sensing, infrastructural heath monitoring, geo-hazard monitoring and mitigation, big data analysis, and sustainable cities. He has received many prestigious honours and awards, such as the AXA Post-Doctoral Fellowship, the Remote Sensing Young Talent Award from the National Remote Sensing Centre of China, and the First Class Prize of the National Surveying and Mapping Science and Technology Progress Award.

Prof. Wei REN
Associate Professor
Faculty of Engineering
The Chinese University of Hong Kong

Prof. Wei REN received his Ph.D. degree from Stanford University in 2013. He is now an Associate Professor in the Department of Mechanical and Automation Engineering at The Chinese University of Hong Kong. His research aims to develop new technologies and understand basic principles in laser spectroscopy and optical gas sensing. His laboratory places a strong emphasis on entrepreneurship in academic pursuits and recently spun out LaSense Technology that offers ultrasensitive gas sensing systems for the environmental protection and energy sectors. Prof. REN serves as the Co-Editor of Springer journal Applied Physics B. He is the senior member of the Optical Society, and the recipient of the Excellent Young Scientists Fund of National Natural Science Foundation of China (2021).

Prof. Patrick WONG
Director
Brain and Mind Institute
The Chinese University of Hong Kong

Prof. WONG is a linguist, cognitive neuroscientist and speech-language therapist whose research centers on cultural and biological factors that lead to variation in language and cognition across individuals. From imaging the brains of infants and older adults, to perceptual psychophysics, grammar learning, gene sequencing, and developing processes to forecast developmental changes, his research is fundamentally interdisciplinary. Over 100 research papers authored by Prof. WONG have been featured in scholarly publications across various disciplines, and his work has been reported on by media outlets such as The New York Times and the Scientific American. He is the founder of Foresight Language and Learning Solutions Ltd.

Thematic Session (Talks) (Listed in order of appearance)

Prof. Mei Po KWAN
Director
Institute of Space and
Earth Information Science
The Chinese University of Hong Kong

Satellite and Mobile Sensing Technologies and Applications: A New Angle to Promote Public Health Infrastructure

Abstract

In this presentation, we address how to integrate Satellite and Mobile Technologies to solve public health and infrastructure health problems. Civil infrastructure safety is a key indicator of a sustainable built environment and satellite images and analysis play a very important role in this. We introduce how to use innovative interferometric synthetic aperture radar (InSAR) technologies and deep learning analytics to achieve deformation monitoring at millimeter accuracy. Then we introduce the projects involving monitoring of two super-infrastructures in Hong Kong, i.e., the reclaimed Hong Kong-Zhuhai-Macao Bridge at the Hong Kong Port and the Hong Kong International Airport. The technologies are expected to be transferred to the Guangdong-Hong Kong-Macao Greater Bay Area and the Belt and Road countries.

To build a smart and pandemic-ready city, we developed a Smart City Environment Sensing System integrating multi-source geospatial big data acquired by earth observation technologies and mobile sensing technologies. This system provides a more accurate assessment of individuals' exposure to environmental or social risk factors, and also assists to develop migration measures and policies to improve health for all. Based on the integrated system of environmental big data and data of individual social contexts, we developed innovative geospatial big data analytical methods to provide solutions for forming effective and targeted intervention measures in response to the COVID-19 pandemic.

Prof. Chunshan SONG
Dean, Faculty of Science
The Chinese University of Hong Kong

Green Energy and Advanced Material Research

Abstract

Advanced materials hold promise for developing more efficient renewable energy systems and more energy efficient manufacturing processes. Green energy is characterized by clean and renewable sources such as solar energy. Heightened global awareness for the negative and potentially catastrophic impacts of climate change has created a drive for society moving towards carbon neutrality. These unique developments have created important needs for innovation and synergistic integration of advanced materials and green energy research. Development of new generation of nano-materials (such as plasmonic metal nanoparticles and organic solar cells) can enable more efficient use of solar energy for processing and sensing, and for solar energy conversion to electricity. Capture and utilization of carbon dioxide, CO2, with advanced nano-porous materials and green energy, has become one of the potential paths towards producing carbon-neutral chemicals and fuels using CO2 for sustainable development. Urban agriculture technology for environment-friendly bio-energy/food development has become critical for sustainability of modern society. These types of innovative and integrated research is being conducted by the researchers in the Faculty of Science at the Chinese University of Hong Kong in its Shatin campus. This presentation will give an overview of the CUHK Faculty of Science and highlight some examples of recent research in physics and chemistry departments and school of life science, along with the potential practical applications.

Prof. Hon Fai CHAN
Assistant Professor
Institute for Tissue Engineering and
Regenerative Medicine (iTERM)
The Chinese University of Hong Kong

Tissue Engineering and Regenerative Medicine Development (I)

Abstract

Prof. Hon Fai CHAN will give a short introduction of the Institute for Tissue Engineering and Regenerative Medicine (iTERM), including its goal, vision, organization, and its target research programs. The aim of iTERM is to integrate multiple disciplines in biomedical sciences, engineering, and clinical medicine, for the purpose of facilitating and fortifying the development of neuromusculoskeletal tissue engineering (TE) and regenerative medicine (RE). iTERM envisions that patients' quality of life will be enhanced by the application of biomedicine in the near future.

Prof. Anna BLOCKI
Assistant Professor
Institute for Tissue Engineering and
Regenerative Medicine (iTERM)
The Chinese University of Hong Kong

Tissue Engineering and Regenerative Medicine Development (II)

Abstract

Prof. Anna BLOCKI will introduce one of iTERM's interests on promoting revascularization in damaged tissues. Tissue (re)vascularization strategies face various challenges from efficacy and ability to emulate complex spatiotemporal signaling. Hence, the research teams developed a new class of therapeutic angiogenesis, comprised from the solidified complex secretome of mesenchymal stem cells (MSCs), highly enriched in pro-angiogenic factors. The insoluble format of the resulting nanostructured MIcroparticles of SOlidified Secretome (MIPSOS) protect protein components from degradation, while facilitating their sustained release. Pre-clinical in vivo experiments demonstrated that MIPSOS accelerated revascularization and healing in skin wounds, exceeding the therapeutic potential of naïve MSC-derived secretome. Ultimately, this approach may address the current major limitations of growth factor- and cell-based therapy approaches.

Prof. Michelle WANG
Research Assistant Professor
Institute for Tissue Engineering and Regenerative Medicine (iTERM)
The Chinese University of Hong Kong

Tissue Engineering and Regenerative Medicine Development (III)

Abstract

Prof. Michelle WANG will introduce another keen interests of iTERM on tendon repair. Tendons are dense collagenous tissues that connect muscle to bone and function in force transmission during musculoskeletal movement. Repair of tendon injuries poses significant clinical challenges due to insufficient endogenous regeneration and high mechanical demands. To augment tendon repair, the research team developed various clinically practical biomaterials, such as an injectable, tendon ECM based-tough hydrogel with a high tendon regenerative capacity and a hydrogel-polyurethane hybrid scaffold with robust mechanical support and tenogenic bioactivity. Additionally, mesenchymal stem cell (MSC)-derived exosomes have emerged as an attractive strategy for promoting tissue regeneration. The teams developed a hydrogel biomaterial that encapsulates human adipose stem cell (hASC)-derived exosomes for sustained exosome delivery as a cell-free therapy for augmenting Achilles tendon repair.

Ms. Elsa WONG
Managing Director
NEC Hong Kong Limited

Industry Insights: NEC's Research and the Future Demand of Technologies

Abstract

Making Space closer through our equipment and technology. NEC is a leading component supplier for satellites and launch vehicles. Our products have been manufactured for over 350 worldwide spacecraft, including satellites.

Japan Aerospace Exploration Agency (JAXA), NEC Corporation (NEC) and NEC Space Technologies, Ltd. (NECSpace) have successfully delivered an on-orbit demonstration of the GPS navigation technology for geostationary satellites, marking the first accomplishment of its kind in Japan. The showcased technology involves a geostationary satellite GPS receiver mounted on an optical data relay satellite, which was launched on November 29, 2020. Signals from GPS satellites are then used to determine the time, position and velocity of satellites in orbit with high precision.

Prof. Wei REN
Associate Professor
Faculty of Engineering
The Chinese University of Hong Kong

Laser-based Gas Sensing: Integrating Upstream Knowledge in Downstream Applications

Abstract

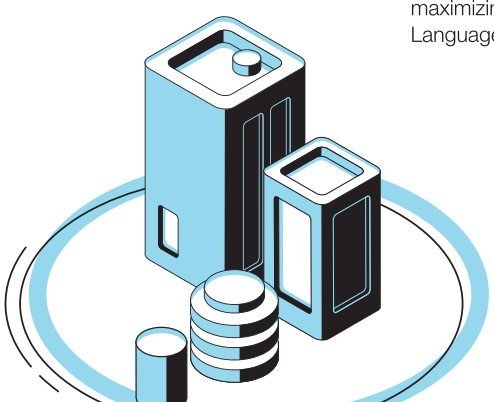
Laser-based gas sensors provide many possibilities for multi-disciplinary research in energy, the environment, and public health. Non-intrusive gas sensors are required for harsh environments and to safely and efficiently monitor the effects of gas on key species. Ultrasensitive sensors for trace gases are required in environmental science to measure air pollutants, as well as in biomedical research to identify biomarkers. In this presentation, Prof. REN will discuss their innovations in advanced laser-based gas sensing techniques including mid-infrared absorption spectroscopy and photoacoustic spectroscopy. Prof. REN will also introduce the real-world translation of these technologies that is being actively carried out in our laboratory. By innovating gas sensors with high sensitivity, high specificity, low cost, portable size and quick response times, we are providing new solutions for air pollution control and carbon emissions monitoring.

Prof. Patrick WONG
Director
Brain and Mind Institute
The Chinese University of Hong Kong

Strategies to Enhance Early Language Development

Abstract

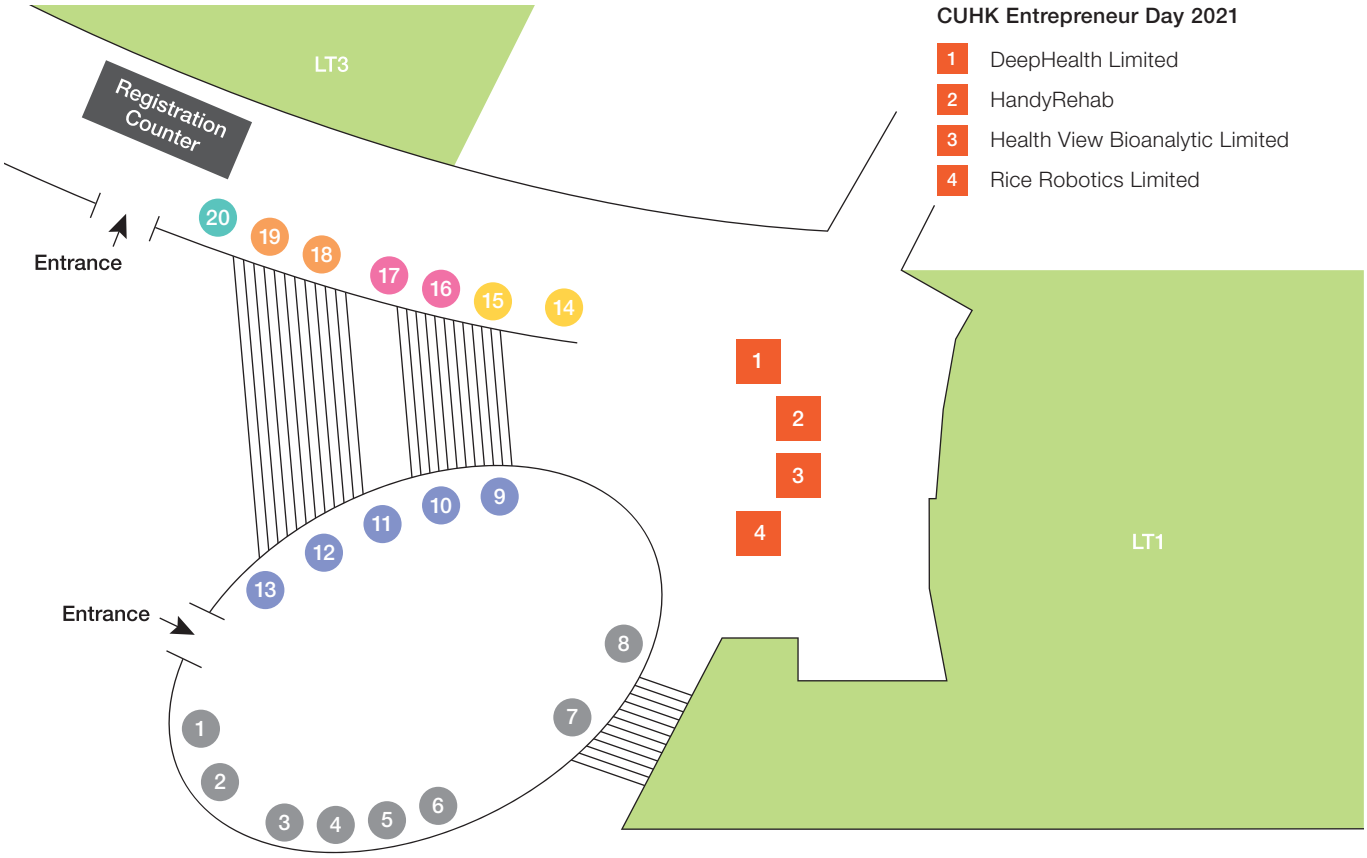
To predict whether an otherwise typically developing child will develop language disorder is challenging. The standard practice of making a clinical language diagnosis is to wait for the child to age before making any assessment. Current testing methods rely heavily on a speech therapist's skill and a child's performance at the moment of testing. The results often lack objectivity and reliability, especially for children who are very young. Because infants cannot communicate verbally, making a diagnosis or prognosis of language impairment is not possible. With the support of ITF, we have developed a technological platform that relies on EEG neural data from infancy to predict language abilities in toddlerhood. Our predictive models are precise enough to enable prediction at the individual child level. Knowledge of their child's predicted language performance allows parents to seek early intervention for the child at the earliest time point, thus maximizing the effectiveness of intervention. Currently, the EEG is marketed by a TSSSU company, Foresight Language and Learning Solutions Ltd, under the trade name of Precision Listening.



Exhibition Booths Floor Plan

Exhibition Date:
23-25 September

Venue:
G/F, Yasumoto International Academic Park (YIA), The Chinese University of Hong Kong



Faculty	Project title	Booth no.
Education	Jockey Club VR Project for Enhancing Chinese Language Literacy	18
	Put your skills to the test! The development of a fundamental movement skills rating system	19
Engineering	Software-Defined Network-Coding-Based Storage for Geo-Distributed Cloud Data Centers	1
	BATS: To Reach where Optical Fibre and 5G Cannot	2
	Miniaturized Articulated Surgical Drill for Confined-Space Bone Work	3
	Multi-material 3D printing with nanometer level resolution	4
	Innovations in Building Construction Robots and Robotics Teaching	6
	Self-Powered Smart Watch and Wristband Enabled by Embedded Generator	5
	Highly Sensitive Gas Sensing and Control System	7
	QuickCAS: An easy-to-use analysis system for quick detection of infectious pathogens in clinical samples	8

Faculty	Project title	Booth no.
Law	Sexual and Reproductive Rights as Social Rights in Nepal: Fostering Access and Implementation	20
Medicine	A Novel Virus-Free Anticancer Gene Therapy	9
	Disruptive technology for early colon cancer and recurrent adenoma prediction	10
	Novel Therapeutic Devices for Knee Osteoarthritis	11
	Creating a COVID-19 Digital Passport for Hong Kong Residents Using Blockchain Technology	12
	Intelligent magnetic anchored and guided endoscope for minimally invasive surgery	13
Science	Tailored-made Hollow Spheres Research	16
	Highly sensitive SERS substrates based on three-dimensional cross- structure of ultralong silver nanowires	17
Social Science	PhotoAir: Measuring indoor and outdoor PM2.5 with a mobile phone	15
	Satellite-aerial-mobile sensing technologies for public and infrastructural health	14

*Exhibition booths listed in alphabetical order (by Faculty)

Jockey Club VR Project for Enhancing Chinese Language Literacy

Prof. Morris JONG
Associate Professor
Department of Curriculum and Instruction
The Chinese University of Hong Kong

Faculty of **Education**

Booth **18**

The Jockey Club VR Project for Enhancing Chinese Language Literacy aims to harness virtual reality (VR) technologies to enhance the effectiveness of learning and teaching Chinese language. Secondary school students, restrained by their life experience and exposure, often show a shallow knowledge and understanding of the subject matters in the learning of Chinese language, and fail to express themselves with personal touch and sensation. VR enables students to be exposed to scenarios outside classrooms without temporal and spatial limitation. Students will be able to "travel through" and observe in details places that they can hardly go in reality like sub-divided flats, the historical Hong Kong, etc. By immersing themselves in the environments, students will find it easier to build connection, develop affection and stimulate thinking and feelings, which are all valuable ingredients for Chinese writing. The Project helps strengthen students' Chinese reading and writing proficiency, literacy and sense of humanistic care.

Uniqueness and Competitive Advantages:

- Integrate e-Learning into Chinese language education
- Overcome the limitations of time, location, weather and number of students
- Base on local literature and landscapes in 9 districts in producing VR teaching materials
- Help students understand the community better and deeper, and reflect on social issues
- Bring depth to students' writing, broaden exposure, and enhance social awareness, connectedness and responsibility
- Provide Teacher Professional Development Programmes: open classes, VR workshops, school-based coaching

Organised by

Centre for Learning Sciences and Technologies
The Chinese University of Hong Kong

Funded by

The Hong Kong Jockey Club Charities Trust

Students are learning via immersive VR field trips.

A 360 degree photo of Yuen Long from up above the sky

Sham Shui Po at night: The life and livelihood of grassroots in the localities

From the Project website's Resources Library: A total of 9 teaching packages featuring different districts (with both face-to-face and online learning options) are available for downloading by teachers.

Each teaching package contains the following items: Introduction, Language Basics, Landscape History, Literature, Interviews with Authors, Overview and VR Teaching Kits, VR Worksheets for Observation, VR Teaching Plan, Composition Topics and Practical Writing Exercises, Oral Exercises, Samples of Good Compositions by Students, Class Demonstration Footage, Rubrics for Writing Assessments, etc.

"Having a broad view of the world is the first and foremost step in literary writing."
– Wong Leung Wo in Interview with Authors (from Teaching Package of Shatin District).

Put your skills to the test! The development of a fundamental movement skills rating system

Prof. Amy HA
Professor
Department of Sports Science
and Physical Education
The Chinese University of Hong Kong

Faculty of **Education**

Booth **19**

Figure 1. Skill assessment using the FMS rater at local primary schools.

Figure 2. Skill assessment using the FMS rater at local primary schools.

Figure 3. An easy-to-use user interface.

Figure 4. Real-time assessment using the rating system.

Figure 5. Assessments are conducted in local schools where data will be stored and analyzed in a big data platform

Fundamental movement skills are considered to be the "building blocks" of more complex exercise skills and sport. Proficiency in these skills is also linked with positive behavioral and health outcomes, including better cardiovascular fitness, healthier weight, more physical activity, and better executive functioning in children. Despite the importance of fundamental movement skills for children's motor skill development and the potential impact on their health, these skills are not currently extensively assessed due to issues with time and accuracy. In this project, we developed an automated system to provide objective, real-time assessment of these skills using 3D motion cameras (i.e., Microsoft Kinect).

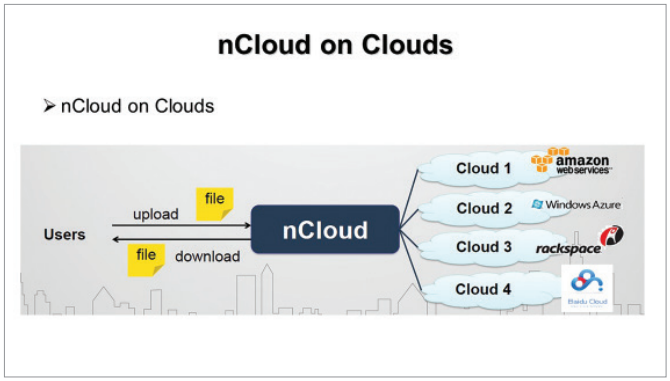
In comparison to traditional methods, the system enables faster assessments, and reduces potential inter-rater inconsistencies. Videos clips and scores collected are also automatically uploaded to cloud servers and can be reviewed through an online portal at any time. The system can enhance teachers' ability to track and review students' progress, and thus, improve the teaching of these important skills.

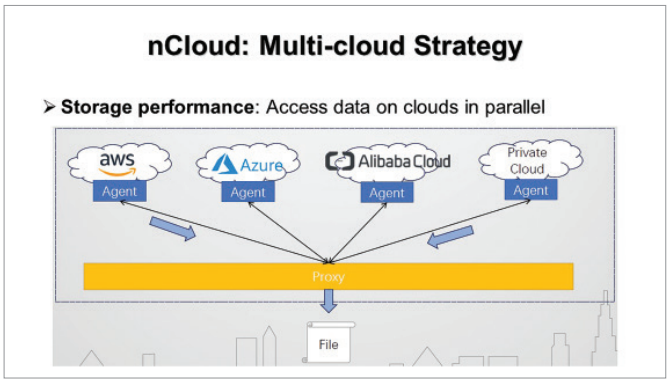
Software-Defined Network-Coding-Based Storage for Geo-Distributed Cloud Data Centers

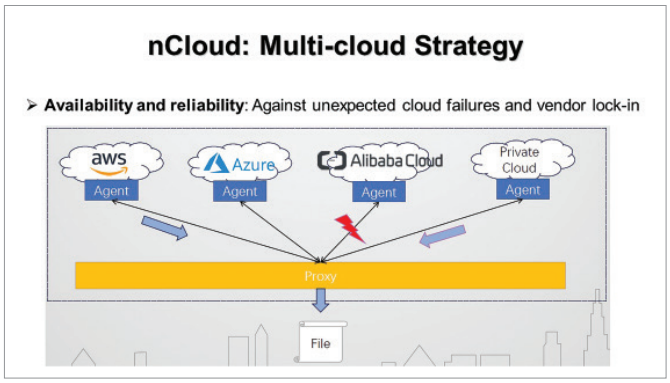
Prof. Patrick LEE
Professor
Department of Computer Science
and Engineering
The Chinese University of Hong Kong

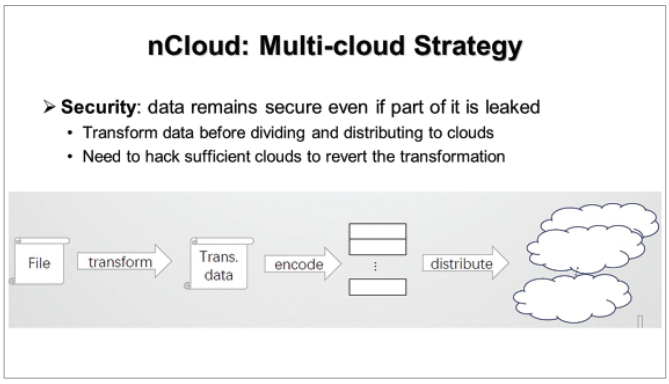
Faculty of **Engineering**

Booth **1**









Enterprises increasingly support hyper-scale data storage in production, yet guaranteeing performance and reliability for big data storage remains a significant challenge. We propose a software-defined network-coding-based cloud storage system, called nCloud that supports geo-distributed cloud data center storage with six design objectives in mind: storage savings, performance, fault tolerance, security, scalability, and configurability. nCloud adapts network coding theory to specifically optimize major performance-critical storage operations and enhance data storage security by distributing data among multiple data centers, thereby lowering operating costs and streamlining access. Its key innovation is to address the hierarchical nature of geo-distributed cloud data centers, such that it first computes partially encoded results from the data stored in each local data center, and then aggregates the partially encoded results across multiple data centers to obtain the final encoded data. Our earlier study shows that such a hierarchical design can theoretically minimize the cross-region bandwidth with minimum storage redundancy and be practically implemented in real-world geo-distributed environments. In addition, the distribution of encoded data across multiple data centers provides fundamental security protection for data storage against malicious attacks on any single data center. We envision that our project findings will benefit the big data storage industry in general.

BATS: To Reach where Optical Fibre and 5G Cannot

Prof. Raymond YEUNG
Choh-Ming Li Professor of Information Engineering
Department of Information Engineering
The Chinese University of Hong Kong

Faculty of **Engineering** | Booth **2**

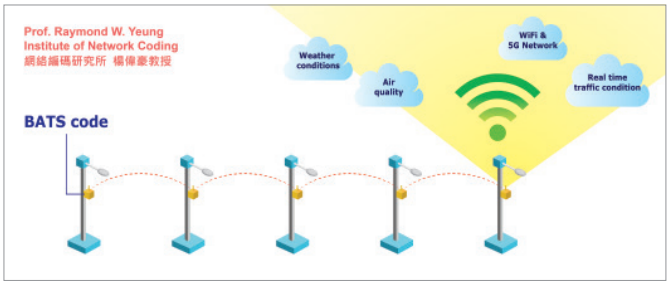


Figure 1. BATS applied to smart lampposts.

Participated in the 47th International Exhibition of Inventions of Geneva, 2019

"Wireless Multi-hop Nework for Smart Lampposts"

Awarded a Gold Medal with Congratulations of the Jury

Figure 2. The application of BATS to smart lampposts winning an invention award.

Figure 3. A smart lamppost on Shing Kai Road.

Figure 4. The Lantau Country Park Pilot Network.

Figure 5. A solar-powered node at Lantau Country Park.

A longstanding issue with wireless multi-hop communication, is the accumulation of packet loss along the transmission path. The more hops the transmission goes through, the larger the end-to-end packet loss. This can cause, for example, pixelation of a video that it is transmitted over a few wireless hops. As such, connections in existing communication systems rarely contain more than 2 wireless links.

BATS is a disruptive technology developed from the fundamental research of Prof. YEUNG's team on Network Coding, a research field co-founded by Prof. YEUNG himself in the late 1990s. BATS solves the wireless communication problem above by recoding data packets at relay nodes. As a result, a high-throughput and low-latency transmission can be achieved over tens or even hundreds of wireless links.

When applied to different communication systems, BATS drastically increases the ceiling capacity of the system, pushing bandwidth, connectivity, and security performances to new heights. This allows the Internet to reach secluded areas, expanding access to information and opportunities to participate in the economy to people living in remote locations.

Hong Kong is the first city to adopt the BATS technology. It has been deployed in the Government's pilot smart lamp post system in East Kowloon, where it is used to transmit data collected at the smart lampposts. This application of BATS won a Gold Medal with the Congratulations of the Jury at the 47th International Exhibition of Inventions of Geneva in 2019. Most recently, it has been deployed in a pilot network at Lantau Country Park in order to provide Wi-Fi services at locations that were not well covered by the cellular network.

Miniaturized Articulated Surgical Drill for Confined-Space Bone Work

Prof. Samuel AU
Associate Professor
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong

Faculty of **Engineering**

Booth **3**

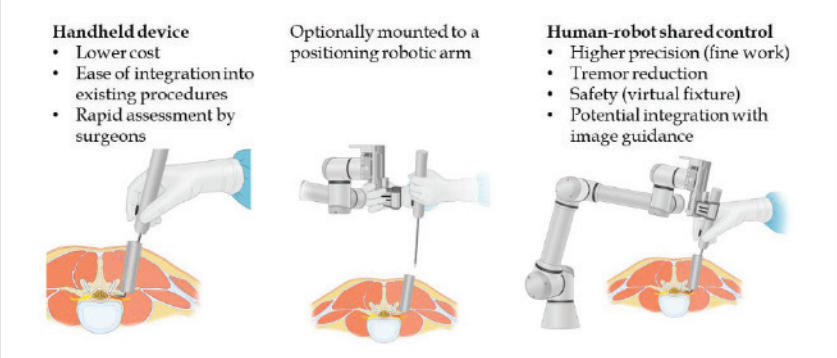


Figure 1. Concept of Manual and Robotic-Assisted Steerable Drill Systems

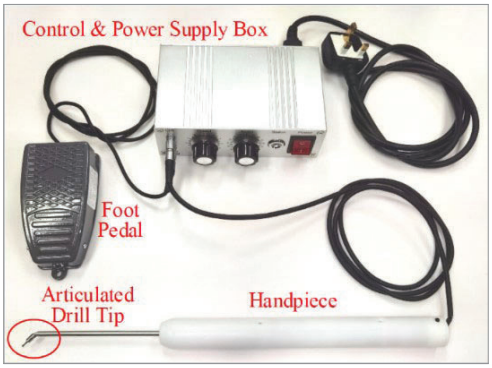


Figure 2. Handheld Articulated Drill System

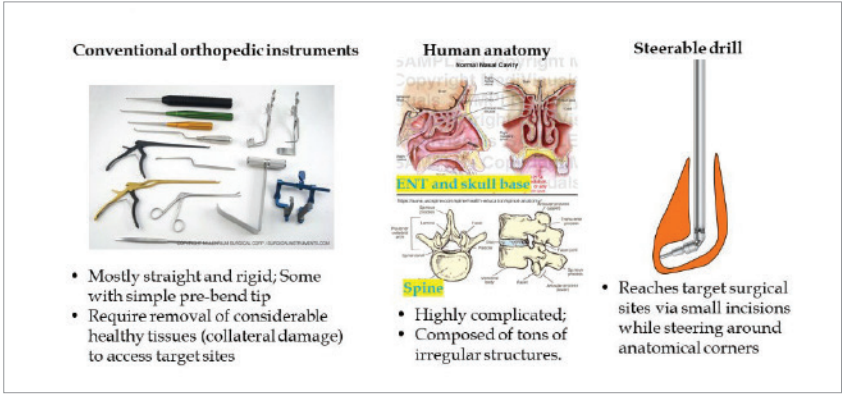


Figure 3. Motivation

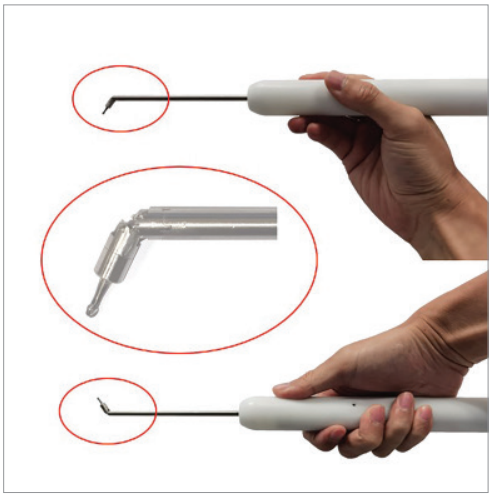


Figure 4. Handheld Articulated Drill Prototype

Conventional surgical bone-work tools are mostly rigid and straight, although some include simple pre-bent tips. By way of contrast, human anatomy is highly complicated, composed of lots of irregular structures. As a result, to access deep target surgical sites, surgeons generally need to remove considerable amounts of healthy tissue. This leads to substantial collateral damage and increases in the duration of hospital stays, recovery time, postoperative pain, and incidence of complications. The goal of this project is to develop a miniaturized steerable surgical drill for bone work in confined spaces. The miniaturized dimension (Φ4.5 mm) and largely enhanced distal steerability (±65 degrees) will enable surgeons to access target sites through small incisions while steering around anatomical corners. Unlike existing tools using flexible continuum mechanisms, this drill uses tendon-driven rolling joints and double universal joints to simultaneously obtain high stiffness and strength, large articulation angles, and nearly zero bend radii. The proposed articulated drill tip is integrated into a lightweight (200 g) pen-style handheld device, which is low-cost and easy to use and integrate into existing surgical procedures. In addition, the handheld device can also be mounted on a robotic arm for higher precision. The potential applications of the proposed device include ENT, skull base, and spine surgery.

Multi-material 3D printing with nanometer level resolution

Prof. Shih-Chi CHEN
Professor
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong

Faculty of **Engineering**

Booth 4

This project combines femtosecond projection two-photon lithography (FP-TPL) with implosion fabrication to realize high-speed multi-material 3D printing with a target resolution of 10 nanometers, which will generate significant impact for the photonics, nanotechnology, and nanomanufacturing industries.

The FP-TPL system employs the concept of temporal focusing to generate programmable femtosecond light sheets from a regenerative laser amplifier and digital micromirror device (Fig. 1); this is equivalent to simultaneously projecting millions of laser foci at the focal plane, replacing the traditional method of serially scanning a laser at one point only, i.e., the FP-TPL technology can fabricate a whole plane within the time that the current point-scanning system fabricates a single point. What makes FP-TPL a disruptive technology is that it not only greatly improves the speed (approximately 100 mm3/hour, 3 order of magnitudes higher than existing state-of-the-art solutions), but also sets new records for increases in printing resolution (~140 nm / 175 nm in the lateral and axial directions) and decreases in print cost (US$1.5/mm3) [1].

To further improve resolution and material choices, a new printing platform is being developed based on swellable hydrogel scaffolds and FP-TPL [2]. To fabricate sub 50 nanometer structures, femtosecond light sheets first perform fast printing in expanded hydrogel scaffolds; next, target materials are deposited in the modified region of the gel scaffold; and lastly, hydrogen chloride is applied to the hydrogel to induce large volume shrinkage for 1,000 - 27,000 times. The shrinkage ratio is adjustable based on the gel composition and processing conditions. Figure 2 presents preliminary fabrication results.

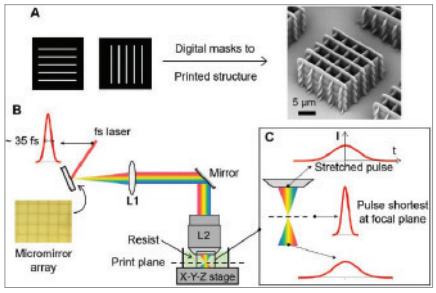


Figure 1. Femtosecond projection TPL based on spatial and temporal focusing. (A) 3D printing with submicrometer resolution using layer-by-layer projection of digital masks. (B) Schematic of the fabrication setup. 2D layers are printed by projecting an image of the micromirror array onto the print plane within the photopolymer resist. Printing can be restricted to layers of <1 mm thickness by generating strong intensity gradients through temporal focusing of the femtosecond (fs) laser. (C) Zoomed-in schematic of temporal focusing in the focal volume of the objective lens, where the shortest pulse is only achieved at the focal (build) plane. I, intensity; t, time. (Images taken from S.K. Saha, D. Wang, V.H. Nguyen, Y. Chang, J.S. Oakdale, S. Chen, "Scalable Submicrometer Additive Manufacturing," Science, Vol. 366, No. 6461, pp. 105-109, 2019.)

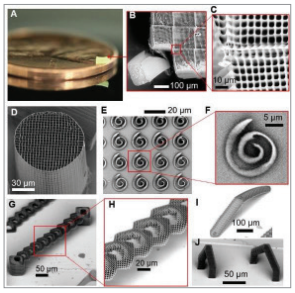


Figure 2. Printing of complex 3D structures with submicrometer resolution via FP-TPL. (A to C) Millimeter-scale structure with submicrometer features supported on a U.S. penny on top of a reflective surface. (D) A 3D micropillar printed through stacking of 2D layers, demonstrating a uniformity of printing that is indistinguishable from that of commercial serial-scanning systems. (E and F) Spiral structures printed through projection of a single layer demonstrating the ability to rapidly print curvilinear structures within single-digit millisecond time scales without any stage motion. (G to J) Overhanging 3D structures printed by stitching multiple 2D projections demonstrating the ability to print depth-resolved features. The bridge structure in (G), with 90° overhang angles, is challenging to print using serial-scanning TPL techniques or any other technique owing to its large overhang relative to the size of the smallest feature and the submicrometer feature resolution.

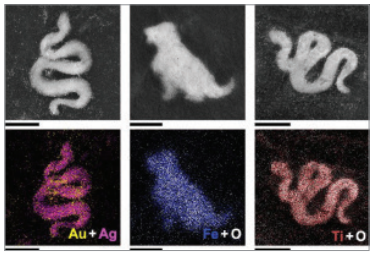


Figure 3. Complex carbon nanotube (CNT) and polyhedron structures made of fluorescence molecules fabricated based on the swellable hydrogel scaffold platform, demonstrating the capability of printing support-free nano-structures for photonic applications.

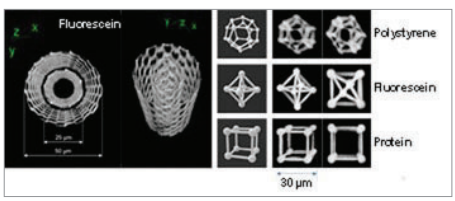


Figure 4. SEM images and EDX characterization results of various alloy and metal oxide animal patterns fabricated based on the swellable hydrogel scaffold platform, demonstrating the capability of multi-material printing. In contrast, the present TPP systems are limited to printing polymer-based structures.

[1] S.K. Saha, D. Wang, V.H. Nguyen, Y. Chang, J.S. Oakdale, S. Chen, "Scalable Submicrometer Additive Manufacturing," Science, Vol. 366, No. 6461, pp. 105-109, 2019.
[2] S. Chen, S. Gu, F. Han, Y. Zhao, A. Klimas, "3D Nanofabrication based on Hydrogel Scaffolds," US Utility Patent Application No. 17/302,671, 2021.

Innovations in Building Construction Robots and Robotics Teaching

Prof. Darwin LAU
Assistant Professor
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong

Faculty of **Engineering** | Booth **6**

Our research focuses on developing building construction robots for various construction and maintenance tasks. First, the reconfigurable CU-Brick robot is a new brick-laying robot solution which allows for complex geometry brick structures to be constructed. The system consists of 8 actuated cables connecting to a gripper end-effector that can place bricks accurately at a given position and orientation. The system also consists of reconfiguration capabilities for the lower cables such that it can avoid interference with the structure being built. Second, a high-rise building façade cable-driven robot for various type of works is shown. The system allows the end-effector platform to be positioned at different positions on the façade in order to perform a range of tasks, such as window cleaning, painting and inspection of concrete and tiles.

In addition to building construction robots, our group develops innovative approaches in teaching of robotics and mechanical engineering. In typical teaching of robotics, lectures slides are 2D in nature, simulations lack realism, and physical robots are less helpful to lecturers as they struggle to teach students fundamental ideas. Mixed reality provides a hybrid mode of learning by combining the advantages of simulations and physical hardware. Furthermore, an experiential learning project will be shown, where students develop a modular task-specific prosthetic system for those in need, such as upper limb amputees or those with finger impairment. During this experience, students are able to apply their engineering skills for a meaningful cause to motivate their learning by increasing the attention, relevance, confidence and satisfaction.

Building Construction Robots

Figure 1.1 Cable-driven parallel robot concept for high-rise façade applications.

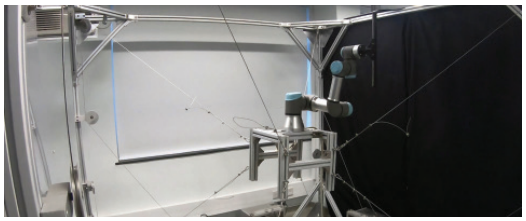


Figure 1.2 Hybrid cable-driven parallel robot with robot arm to perform façade works.

Figure 1.3 Reconfigurable cable-driven parallel robot CU-Brick exhibit at the Hong Kong Science Museum.

Figure 1.4 CU-Brick concept of setup at the CUHK Yard for Environmental Sustainability real-site build.

Innovations in Teaching of Robotics and Mechanical Engineering

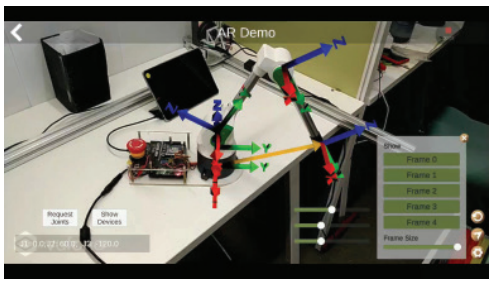


Figure 2.1 Mixed reality showing internal information of the robots to aid students learning of robotic fundamentals.

Figure 2.2 Modular prosthetic device with snooker tool.

Figure 2.3 Modular prosthetic device with badminton tool.

Figure 2.4 Modular prosthetic device with wok tool.

Self-Powered Smart Watch and Wristband Enabled by Embedded Generator

Prof. Wei Hsin LIAO
Choh-Ming Li Professor of Mechanical and Automation Engineering
Department Chairman
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong

Faculty of **Engineering** | Booth **5**

The limited battery life of smart watches and wristbands remains a pain point. The research team designed an embedded and compact electromagnetic generator so that these wearable gadgets can be self-powered. Unlike existing products, the invention uses a novel magnetic frequency-up converter and harnesses the kinetic energy of human motion. A converter transforms the low-frequency arm swing to achieve the desired output power.

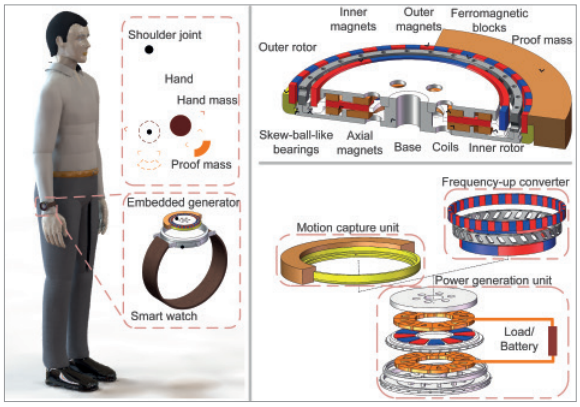


Figure 1 Principle and design of the embedded generator

Figure 2 Prototype of the embedded generator

Figure 3 Harvesting human motion to power smart devices (CUHK eNews, Jan. 2021)

Key Features:

- Compact arrangement to improve the space utilization rate
- Integration of several functional units in limited space
- Efficient frequency-up conversion mechanism

Uniqueness and Competitive Advantages:

- > 4x output power and 10x power density compared with existing technologies
- Improves energy conversion efficiency by eliminating mechanical friction
- Avoids damage caused by impact force, saving on maintenance or replacement
- Compact and easily embedded in wearable electronics

Applications:

- Pedometer
- Sleep monitoring
- GPS

Target Users:

A variety of people who possess smart watches and wristbands. The embedded generator can provide sustainable power supply for those wearable devices.

Patent Applications:

- Apparatus and Methods of Embedded Human Motion Energy Harvester for Wearable Electronics, China Patent Application, 201910104425.X, 1 February 2019
- Human Motion Energy Harvesting Apparatus and Conversion Method Thereof, US Non-Provisional Patent Application, No. 16/560,350, 4 September 2019; US Patent Application Publication, 2020/0251962 A1, 6 August 2020

Awards and Recognitions:

- Gold Medal, International Exhibition of Inventions Geneva, 2021
- 2021 ASME Energy Harvesting Best Paper Award, American Society of Mechanical Engineers
- Reported by AP News, Beyond batteries: Inside the latest innovation poised to power our smart wearables

Highly Sensitive Gas Sensing and Control System

Prof. Wei REN
Associate Professor
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong

Faculty of **Engineering**

Booth **7**

This project aims to (a) develop novel spectroscopic techniques for trace gas sensing, (b) to innovate laser diagnostics for environmental monitoring and industrial process control, and (c) to understand the fundamental processes in energy and biomedicine. The research team has innovated laser spectroscopic techniques with artificial intelligence to achieve ultrasensitive, ultra-dynamic-range and online gas detection. They have invented a portable and highly sensitive gas sensing system that can provide a variety of information about the concentration, temperature, and pressure of multiple harmful gas components such as CO, NOx, NH3, SO2 in real time. The technology has adopted advanced laser spectroscopic technology and artificial intelligence allowing direct applications to the fields of environmental protection (including exhaust monitoring in power plants), the petrochemical industry, the automotive industry (vehicle emissions), and to medical treatment (monitoring the components of patients' breath).

Our research to date has resulted in more than 80 peer-reviewed journal publications and 6 US and Chinese patents. These sensors are expected to further contribute to the next-generation sensing systems required for robotics and smart cities. LaSense Technology, founded as a spin-off company from our laboratory, has won many prestigious awards including a gold medal in 2021 International Exhibition of Inventions Geneva, a grand-class award in the 6th Hong Kong University Student Innovation and Entrepreneurship Competition, a gold medal in the 12th Challenge Cup China University Student Entrepreneurship Plan Competition, and received a multi-million yuan angel investment in 2021.

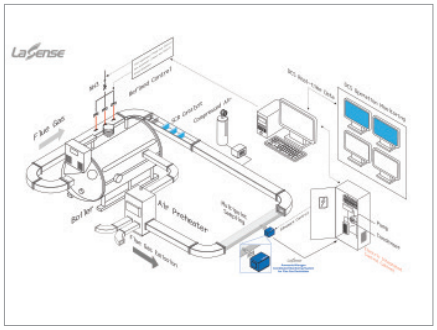


Figure 1. Ammonia-nitrogen coordinated monitoring system for flue gas denitration.

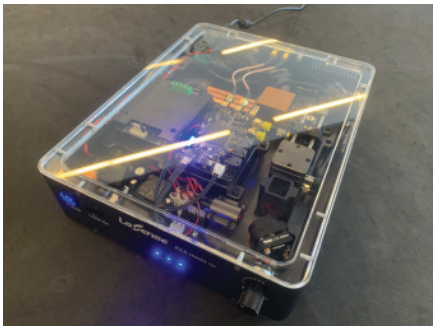


Figure 2. Ultrasensitive photoacoustic gas sensor.

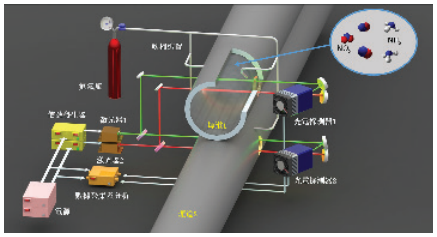


Figure 3. Schematic of the NH3 and NO online monitoring system.

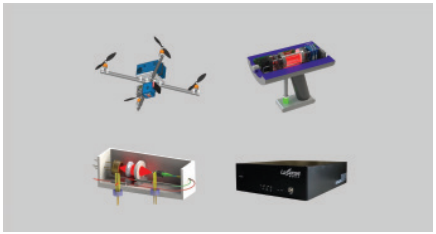


Figure 4. Next-generation portable gas sensors.

QuickCAS: An easy-to-use analysis system for quick detection of infectious pathogens in clinical samples

Prof. Li ZHANG
Professor
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong

Faculty of **Engineering**

Booth **8**

As the COVID-19 pandemic rages worldwide, rapid testing with automated detection systems is necessary for effective diagnosis and infection control. Delayed diagnosis not only further burdens the healthcare system but may also cost patients' lives.

QuickCAS is a rapid, fully automated and accurate diagnostic system that uses a revolutionary microrobotic sensing technology, benefitting both clinicians and patients. The microrobotic sensing probes (microrobots) are based on G. lucidum spores, iron oxide nanoparticles and carbon dots. By analyzing the changes in the fluorescence signal of the microrobots under magnetic actuation, the presence of pathogens in patients' samples can be determined. The above result was published in Science Advances (AAAS) in 2019. In addition, the microrobots can be further modified to detect various selected toxins/viruses/bacteria with a high level of accuracy.

Combining this novel microrobot and automation technology, QuickCAS enables pathogen detection in as quickly as 15mins. Besides speed, cost and automation advantages, QuickCAS requires no specialists to operate and involves only 4 simple steps for sample preparation. The automated process also reduces the risk of infection to technicians during the testing process as exposure to pathogens is minimized.

To help doctors utilize this innovative technology, MicroMag Healthcare, a spin-off company, was established to commercialize these research results. MicroMag is now working towards a clinical trial of our C. diff sensing probe and are studying the application of QuickCAS for multiple pathogens including the COVID-19 with medical doctors. MicroMag aims to provide clinicians/patients with instant, accurate and effortless diagnosis to prevent infectious outbreaks and to save lives through our innovative microrobotic technology.

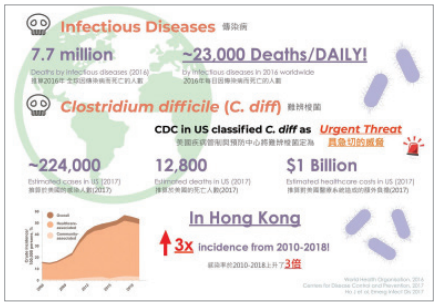


Fig. 1 Simple workflow and the advantage of QuickCAS

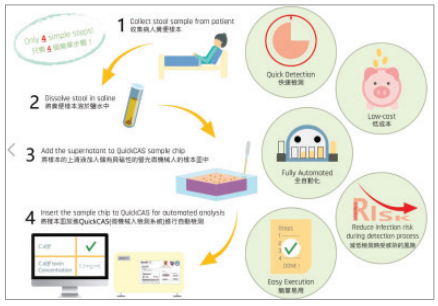


Fig. 2 Significance of infectious disease and C. diff (our first target)

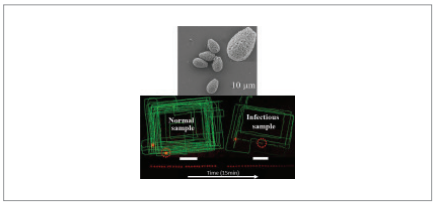


Fig. 3 (Upper) SEM image of microrobotic sensing probe (Lower) Fluorescence of microrobot will extinguish within 15mins when added to a sample containing infection

Fig. 4 Prototype of QuickCAS

Fig. 5 MicroMag Healthcare founders

Sexual and Reproductive Rights as Social Rights in Nepal: Fostering Access and Implementation

Prof. Mara MALAGODI
Assistant Professor
Faculty of Law
The Chinese University of Hong Kong

Faculty of **Law**

Booth **20**

#DesignTheLawNepal aims to create a space for all Nepali citizens to understand their sexual and reproductive rights using both accessible language and engaging explainers to exploit the power of visual communication methods.

#DesignTheLawNepal is a collaborative project between the Faculty of Law at the Chinese University of Hong Kong (CUHK LAW), the City Law School of the University of London, and iProbono. Led by Mara Malagodi at CUHK LAW, the team includes Rehan Abeyratne and Ngoc Bui Son at CUHK LAW, Emily Allbon and Sabrina Germain at City, and Mariam Faruqi, Meenakshi Menon, Bandana Upreti, and Barun Ghimire at iProbono. All the artwork of the legal design toolkit is by illustrator and comic artist Kripa Joshi.

This interdisciplinary project brings together academics, practitioners, activists and creatives with a view of advancing sexual and reproductive rights through methods of legal design and comparative law. It aims to foster changes to the legal system centered around the sexual and reproductive well-being and dignity of individuals. It also seeks to enhance the implementation of existing rights by raising awareness of these rights and access to medical and legal services.

The legal design toolkit comprises:

- 1 explainer on the Lakshmi Supreme Court's decision on abortion. About 5 A4 pages;
- 1 explainer on the Prakash Mani Sharma Supreme Court's decision on uterus prolapse (as above). About 5 A4 pages;
- 1 infographic sheet mapping key provisions on reproductive rights in Nepal (from constitution to legislation and key court decisions). 1-page A4;
- 6 cards for six personas. We envision each card to be an A4 sheet, folded into two A5 pages;
- 1 logo for the project #DesignTheLawNepal.

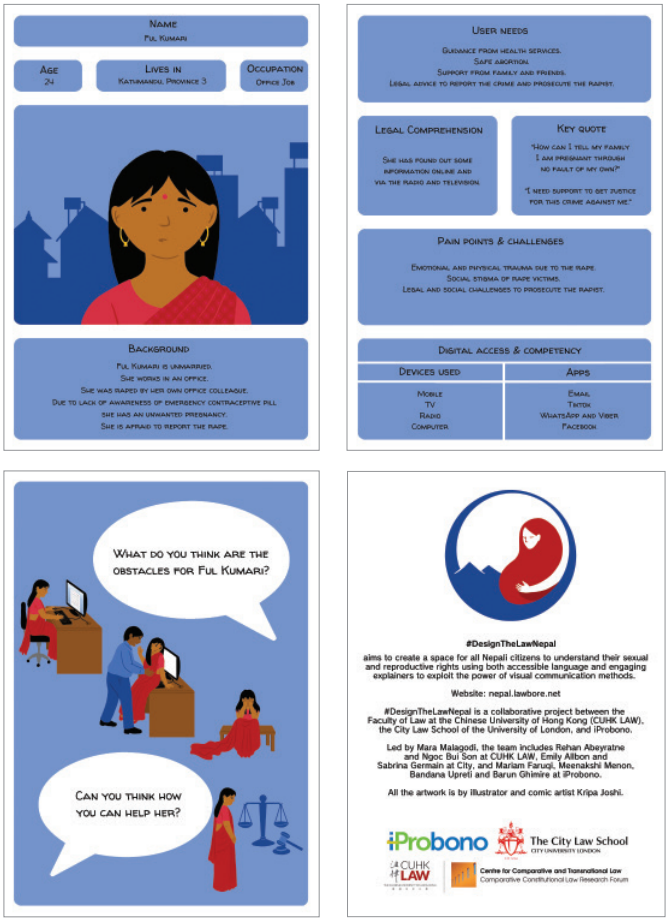


Figure 1. Persona example

A Novel Virus-Free Anticancer Gene Therapy

Prof. Patrick TANG
Assistant Professor
Department of Anatomical
and Cellular Pathology
The Chinese University of Hong Kong

Faculty of **Medicine**

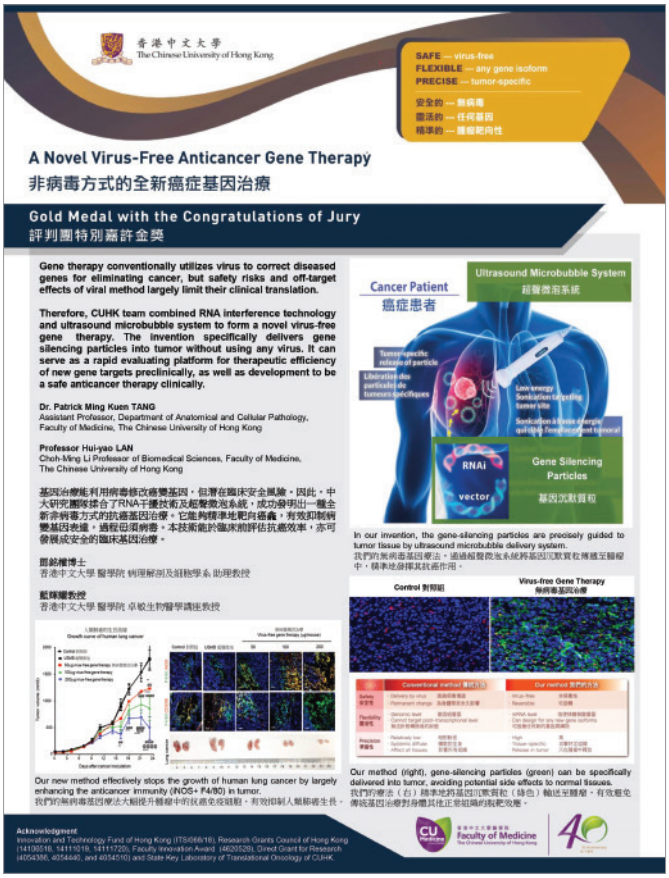
Booth **9**

A novel virus-free anticancer gene therapy developed by Dr. Patrick TANG, Assistant Professor, Department of Anatomical and Cellular Pathology; and Professor Huiyao LAN, Choh-Ming Li Research Professor of Biomedical Sciences, was awarded a Gold Medal with the Congratulations of the Jury Medal in the International Exhibition of Inventions Geneva 2021.

Massive pathogenic genes have been discovered for cancer, but the lack of corresponding target drugs largely limits the clinical application of these findings. Although gene therapy can utilize viruses to modify diseased genes to eradicate cancer, viral vectors have certain clinical safety risks. To address this challenge, the research team invented a new gene therapy that can regulate gene transcription without using a virus.

The CUHK research team has combined RNAi interference technology and an ultrasonic microbubble system to guide shRNA expression plasmids into tumor tissues to induce therapeutic effects by inhibiting the diseased genes at transcriptome level. Importantly, no virus is used throughout the process. This invention can be used as a rapid evaluation platform to assess the anticancer efficiency and the safety of new therapeutic targets preclinically. The technology can also contribute to the further development towards safe targeted gene therapy clinically.

Acknowledgment: Innovation and Technology Fund of Hong Kong (ITS/068/18), Research Grants Council of Hong Kong (14106518, 14111019, 14111720), Faculty Innovation Award (4620528), Direct Grant for Research (4054386, 4054440, 4054510) and State Key Laboratory of Translational Oncology of CUHK.

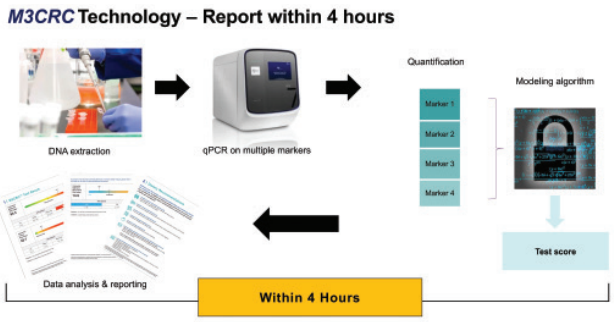


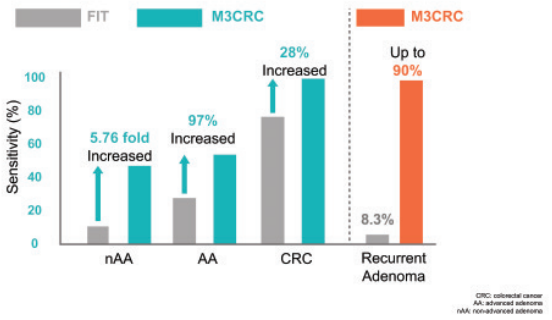
Disruptive technology for early colon cancer and recurrent adenoma prediction

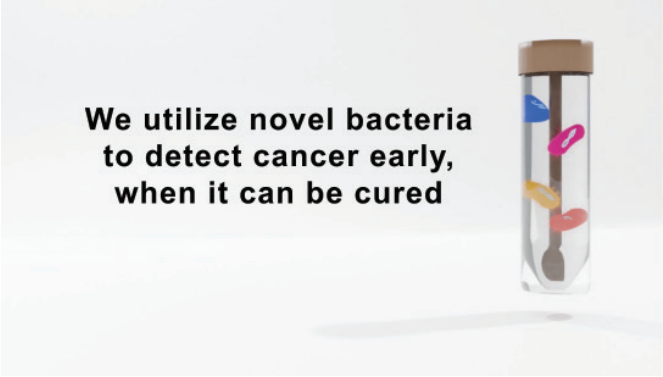
Prof. Siew Chien NG
Assistant Dean (Development)
Professor
Prof. Francis CHAN
Dean
Choh-Ming Li Professor of Medicine and Therapeutics
Prof. Jessie LIANG
Research Associate Professor
Department of Medicine and Therapeutics
The Chinese University of Hong Kong

Faculty of **Medicine**

Booth **10**







The no. 1 cancer, colon cancer (CRC), is preventable but only with accurate early detection

Since 2013, CRC has surpassed lung cancer as the most commonly diagnosed cancer. The 5-year survival rate of patients with stage I colorectal cancer was 96% but dropped dramatically to less than 10% when patients were diagnosed at stage IV. As most colorectal cancers originated from polyps, early detection and removal of polyps can prevent development of cancer.

Major shortcomings of current CRC screening tools

- Cannot detect polyps (FIT < 50% sensitive for stage I cancer)
- Colonoscopy is invasive and need bowel preparation
- Recurrence can only be determined by colonoscopy

M3CRC – the world's first non-invasive test for recurrent adenoma detection

With over a decade of research, our team discovered novel fecal bacterial DNA markers from unique metagenomic dataset of thousands of subjects. It is the first test to offer non-invasive approach for early CRC and adenoma recurrent using fecal "bacterial DNA markers".

Features of M3CRC

- 94% sensitivity for CRC detection, comparable to that of colonoscopy
- Sensitivity for adenoma is superior to other non-invasive tests
- Up to 90% sensitivity for adenoma recurrence
- Non-invasive, can be done at home
- Dietary recommendations included
- Patent pending in Hong Kong, USA, Europe, China and Taiwan

Novel Therapeutic Device for Knee Osteoarthritis

Prof. Ling QIN
Assistant Professor
Department of Orthopaedics & Traumatology
The Chinese University of Hong Kong

Faculty of **Medicine**

Booth **11**

Many elderly suffer from knee osteoarthritis and related degenerative diseases. However, due to limited medical resources and an ageing population, patients have to wait for months for physiotherapy treatment in hospital. To provide elderly a safe, reliable and effective personalized physiotherapy, our team has developed an easy-to-use smart therapeutic device for prevention and treatment of knee joint degeneration diseases. By combining low-level laser therapy, heat therapy, deep tissue stimulation and smart evaluation technology, the device is a promising solution to relieve pain, stimulate the musculoskeletal system and promote joint tissue regeneration.

Uniqueness and Competitive Advantages

- World's first patented home medical therapeutic device to provide treatments on the popliteal fossa
- 3-in-1 rechargeable device with medical grade low-level laser therapy (LLLT), FDA approved thermotherapy, and deep tissue stimulation (compression roller) to promote tissue repairing, blood and lymphatic circulation, and reduce inflammation
- Equipped with smart evaluation technology offering auto-adjustment, such as speed, pressure, temperature, energy output of laser therapy and treatment duration

Testing on 43 elderly participants in a 2-month clinical trial showed comparable results to the use of clinical treatments in hospitals.

Figure 1. Structure of the knee therapeutic device

Figure 2. Subject under test by using the therapeutic device

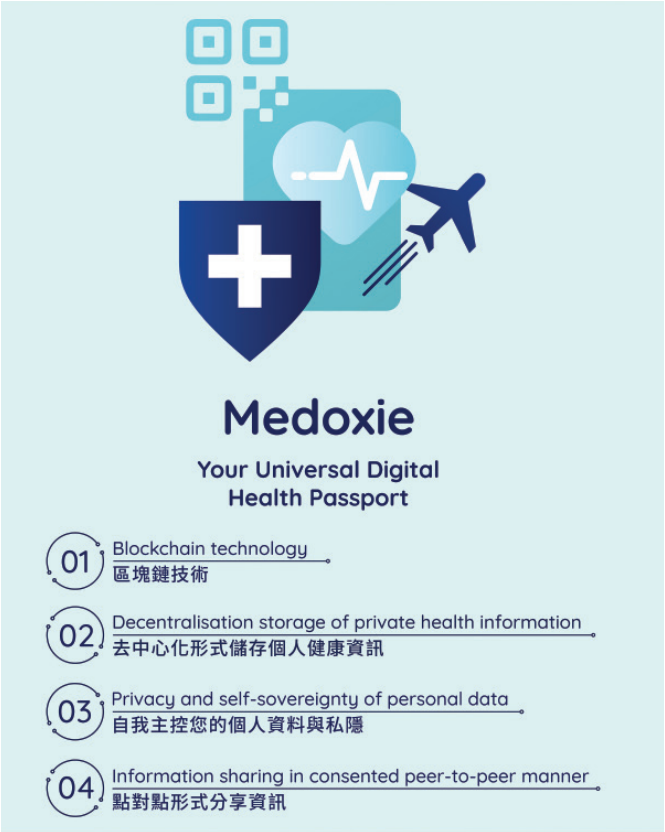
Figure 3. The design of the knee therapeutic device

Creating a COVID-19 Digital Passport for Hong Kong Residents Using Blockchain Technology

Prof. Marten Erik BRELEN
Assistant Professor
Department of Ophthalmology
and Visual Sciences
The Chinese University of Hong Kong

Faculty of **Medicine**

Booth **12**



During the pandemic, there is an ongoing need for frequent covid-19 testing, daily temperature checks and keeping documented contact histories. In the foreseeable future, there will also be a need to document immunity as well as vaccination status. This data is vital to reopening our borders, as well as giving people safe access to public areas. The development of digital “passports” that contain the protected health information (PHI) of an individual using blockchain technology may be the best solution.

Blockchain technology ensures the confidentiality, validity and immutability of personal private data and records the consent of which data can be shared with specific parties. It is a decentralized distributed ledger, so no individual or organisation is required to store and maintain the data. The data and transactions in the ledger can be verified and tracked by creating an auditable chain of timestamped events. The advanced cryptography and the secure end-to-end encryption used in blockchains prevents outside hacking or interference. Open and transparent authorship of who wrote the on chain data provides accountability and trustworthiness of the data.

Individuals maintain their ownership and self-sovereignty of their PHI. They can share their COVID-19 health status by granting or revoking consent to specified persons on the network. The harvesting of big data is one of the major use cases for blockchain. This platform not only provides the secure and trusted network to share covid data but may give us a deeper understanding of how we can overcome the pandemic.

Intelligent magnetic anchored and guided endoscope for minimally invasive surgery

Prof. Zheng LI
Associate Professor
Department of Surgery
The Chinese University of Hong Kong

Faculty of **Medicine**

Booth **13**

Endoscopes are eyes of surgeons in minimally invasive surgery. Conventional endoscopes are chopstick-like and are manipulated by assistants. This invention is a magnetic anchored and guided endoscope that can be placed inside the surgical cavity and tack surgical instruments automatically. The system contains a deep learning powered robotic magnet controller and a miniature magnetic endoscope that stays in the surgical cavity. The endoscope view is fully controlled by the external magnet with a robot.

Benefits

This invention reduces patient's trauma by eliminating the dedicated endoscope port. It lessens surgeon's burden and smooth the surgical procedure by reducing instruments fencing, providing wider and multi-angle view, self-cleaning and automatic view control. In addition, it reduced manpower by intelligent robotic control.

Awards

Bronze, 2021 Geneva International Exhibition of Inventions

Gold, 2019 EMedic Global – Singapore

Granted Patents

US 2019/0159668 A1

CN 108778092A

Funding support

RGC/GRF (Ref. 14203019)

ITF (Ref. ITS/126/16)

Multi-scale Medical Robotics Centre @ InnoAIR

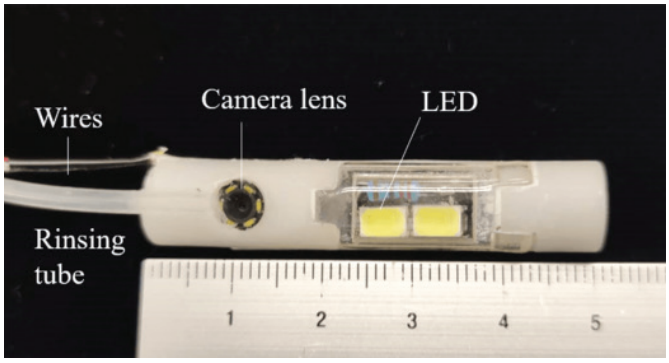


Figure 1. The magnetic anchored and guided endoscope prototype

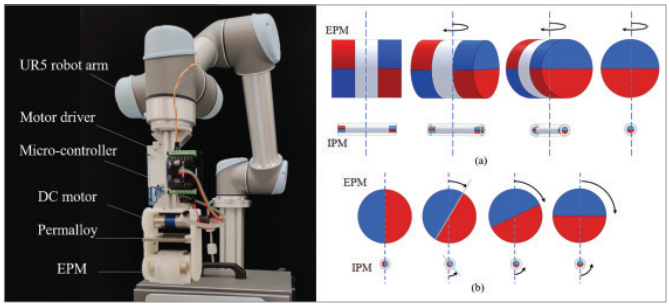


Figure 2. Intelligent robotic magnet controller and its working principle

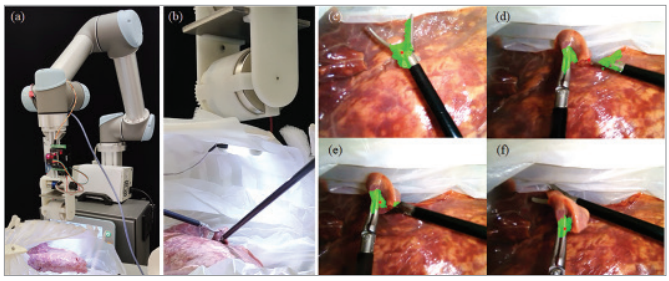
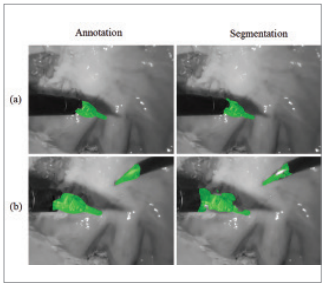


Figure 3. Magnetic anchored and guided endoscope for mock-up lung wedge resection



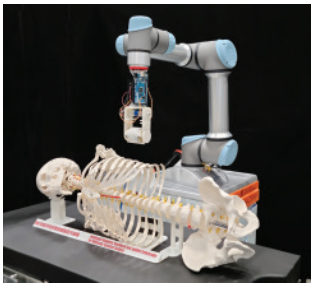


Figure 4. Magnetic anchored and guided endoscope for annotation and segmentation during lung wedge resection

Tailored-made Hollow Spheres Research

Prof. To NGAI
Assistant Dean (Research)
Professor
Department of Chemistry
The Chinese University of Hong Kong

Faculty of **Science**

Booth **16**

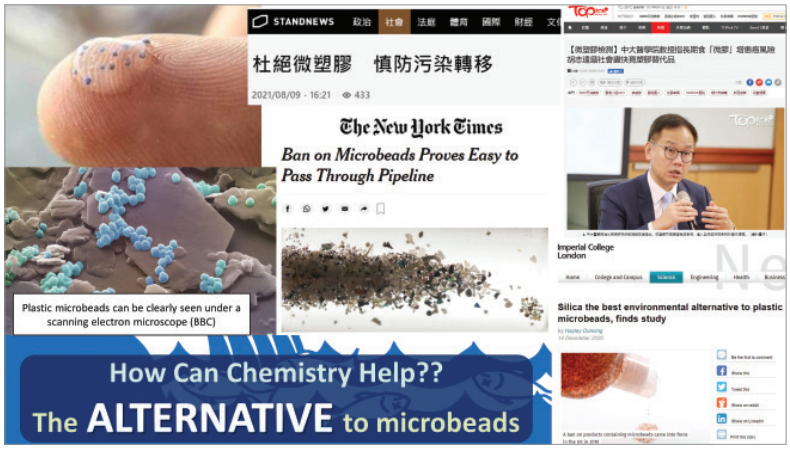


Figure 1. Growing Concern Over Microbeads

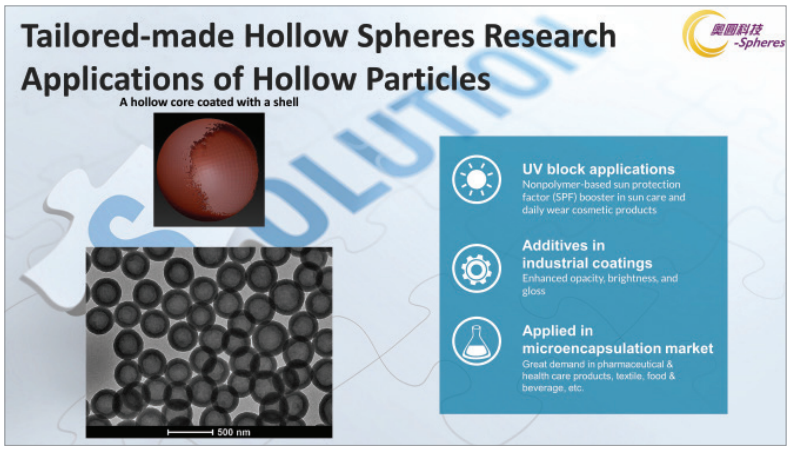


Figure 2. Applications of Hollow Particles

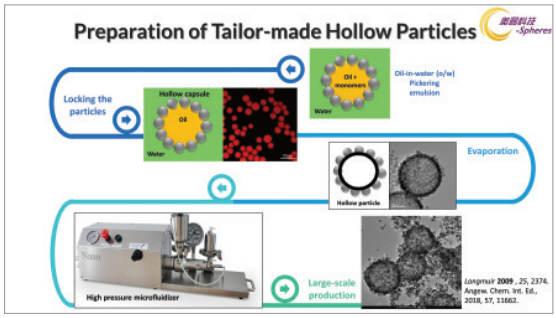


Figure 3. Preparation of Tailor-made Hollow Particles

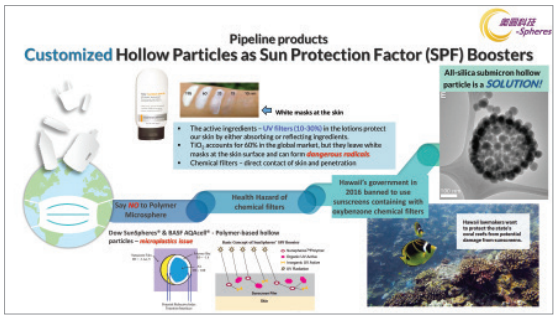


Figure 4. Customized Hollow Particles as Sun Protection Factor (SPF) Boosters

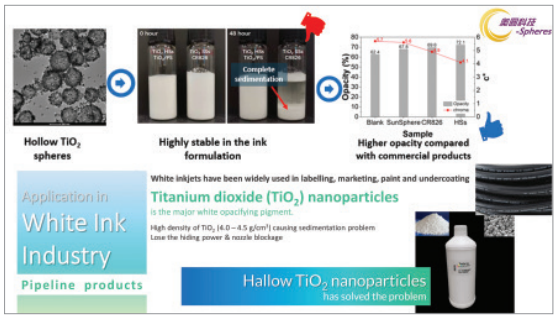


Figure 5. Application of Hollow Particles in White Ink Industry

Hollow sphere powder is a kind of powder contained interior hollow structures, with dimensions ranging from nanometer to micrometer. Owing to their special properties, such as high contrast optical and excellent light scattering properties, hollow spheres have been widely applied in the ink and cosmetic industries.

Sunscreen products rely on active ingredients - ultraviolet (UV) filters to protect our skin from the sun. However, there has been health concerns regarding both chemical and physical UV filters used in the cosmetic products, including skin absorption and the formation of dangerous radicals. The cosmetic industry has tried to solve this problem by replacing filters with polymer-based particles. However, the use of these particles leads to microplastics which threaten aquatic life. An opportunity thus exists for the development of inorganic submicron hollow particles as solution for problems associated with current formulations including potential health hazards and environmental threats.

White inkjet inks have been widely used in labelling, paint, and undercoating. Inorganic pigments such as titanium dioxide (TiO_2) or zinc oxide (ZnO) are the main white colorants for inkjet ink. However, a significant challenge in formulating white ink with TiO_2 pigment is its propensity for sedimentation due to the high density of TiO_2, which not only leads to the loss of hiding power but also causes nozzle blockage during printing. Novel hollow TiO_2 particles recently developed by Professor NGAI's team provide a solution to this problem. A team of interdisciplinary researchers from CUHK and Xianhong Science (Hong Kong) Limited have also joined forces to solve the challenges of formulating hollow TiO_2 particles for white ink.

Highly sensitive SERS substrates based on three-dimensional cross- structure of ultralong silver nanowires

Prof. Jianfang WANG
Professor
Department of Physics
The Chinese University of Hong Kong

Faculty of **Science**

Booth **17**

This project has developed a novel SERS substrate based on the three-dimensional cross-structure of ultralong silver nanowires. This novel SERS substrate has four advantages over traditional SERS substrates. On the one hand, plasmon coupling at the junctions in networks can generate high density of "hotspots", where the local electromagnetic field is largely enhanced. The “hotspots” can highly enhance the Raman signals of molecules trapped around them. The "hotspots" in our newly developed SERS substrate are numerous and uniformly distributed on a macroscopic scale. For traditional SERS substrates composed of other shapes of plasmonic nanoparticles, the "hotspots" only exist at a few sharp corners of the nanoparticles. The increase of “hotspots” in traditional SERS substrates can only be achieved by the increase of the number of nanoparticles. However, the densely packed nature of the nanoparticles themselves will cover some “hotspots”, and this in turn limits detection sensitivity. Our SERS substrate is based on a three-dimensional cross-structure of ultralong silver nanowires. We can simply increase the number of crossed “hotspots” by extending the length of the silver nanowires. The "hotspots" in our novel SERS substrate will also recombine after the contact with a probe solution, so that the probe molecules can fully make contact with the “hotspots”, greatly improving detection sensitivity. In addition, the diversity of the morphology and size of the silver nanowires makes them possess a wide wavelength range of plasmon resonances, which facilitates the wide-spectrum measurement. Last but not least, the SERS substrate based on the three-dimensional cross-structure of silver nanowires can be mass-produced without the use of expensive equipment, which will make it possible to reduce the price of our Raman substrates by more than 1/3 compared with the current commercially available Raman substrates.

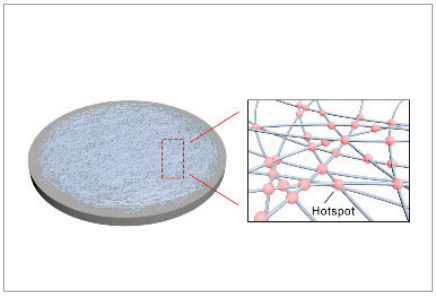


Figure 1. Schematic of three-dimensional cross-structure of silver nanowires and the generated “hotspots”.

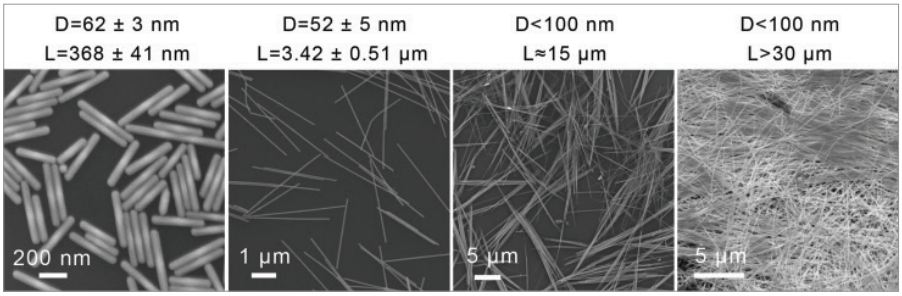


Figure 2. Scanning electron microscope images of four representative samples of silver nanowires. The average diameter (D) and length (L) of each sample are shown above each image.

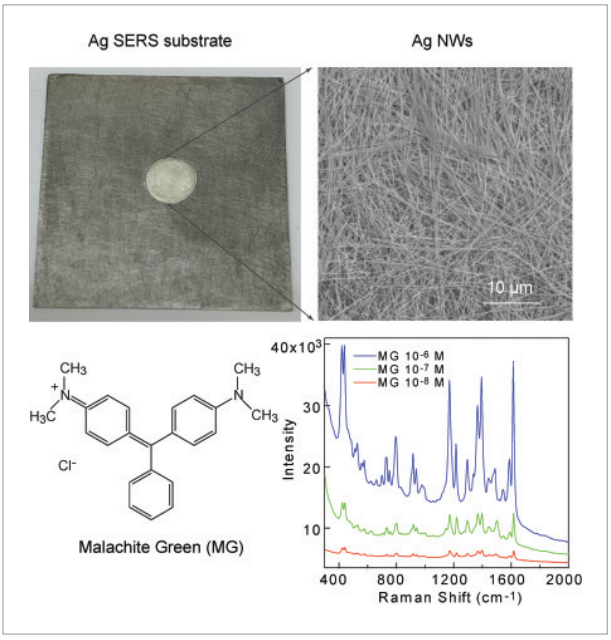


Figure 3. The SERS substrate based on three-dimensional cross-structure of silver nanowire: Structure (top row) and SERS performance (bottom row).

PhotoAir: Measuring indoor and outdoor PM2.5 with a mobile phone

Prof. Bo HUANG
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Department of Geography
and Resource Management
The Chinese University of Hong Kong

Faculty of **Social Science**

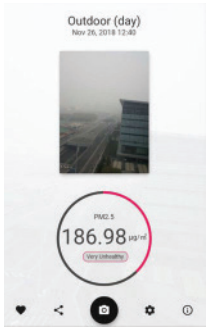
Booth **15**

Air pollution is the world's largest environmental health threat, accounting for 7 million deaths globally every year. Photo Air is a mobile phone App, which aims to provide every smartphone user with a tool to monitor outdoor and indoor air quality in real time so as to reduce human exposure to polluted air.

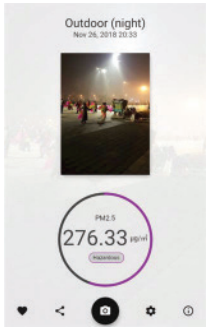
A user of Photo Air App only needs to take a photo to be able to measure PM2.5 concentrations immediately, either outdoors and indoors, at any time of the day or night. The App also provides guidelines on suitable outdoor or indoor activities, depending on the level of air pollution identified.

The App promises to achieve significant savings in the field of air pollution monitoring. It does not require the construction of numerous monitoring stations over a large area. It also overcomes the inconvenience of carrying specialized instruments to measure outdoor or indoor PM2.5 concentrations over a large area, through different rooms or between buildings. The use of Photo Air significantly reduces the cost and improves the efficiency of air pollution measurement, while achieving levels of accuracy comparable to those of traditional measuring devices.

Photo Air will benefit billions of people around the world who suffer from severe air pollution. Individuals who are concerned about their health will be able to measure PM2.5 concentrations both inside and outside their living and working environments (including inside vehicles). They will be able to estimate their exposure to PM2.5 on a daily basis. Individuals with long-term exposure to environments with high PM2.5 concentrations, such as construction workers, are already recommended to consider regular medical examinations to screen for diseases related to long-term exposure to air pollutants. In this way, the Photo Air App will function as a cheap and reliable personal health assistant for at risk populations.



An outdoor snapshot of Photo Air during daytime.



An outdoor snapshot of Photo Air during nighttime.

An indoor snapshot of Photo Air during daytime.

Gold medal – International Exhibition of Inventions Geneva

Loading interface

An outdoor snapshot of Photo Air during daytime.

An outdoor snapshot of Photo Air during nighttime

SCAN ME

Scan to download

Interested to know more about how CUHK innovation is being commercialised?

Please join CUHK Entrepreneur Day 2021!

www.alumni.cuhk.edu.hk/cuhkeday

DeepHealth Limited

Prof. Kelvin TSOI
JC School of Public Health and Primary Care
The Chinese University of Hong Kong

HealthCap is a digital platform for blood pressure management, capturing readings of blood pressure meter and recording blood pressure data

STAGE OF DEVELOPMENT:
Growth & Scaling

DISTINGUISHED FEATURES

- "One to Many" digital health management platform supports a user to manage blood pressure records for multiple users to take care of their health.
- Adaptive to most of the blood pressure meters in the market, cost-saving with no additional device is needed.
- Heath report is recognized by professor in CUHK School of Medicine, assisting doctors for better diagnosis.

RESPONSE TO MARKET PAIN POINTS

There's a lack of patients self-monitoring and self-care ability for effective hypertension control, lack of home blood pressure management. We aim to empower patients' self-management of hypertension at home and to facilitate an effective consultation by offering HealthCap, a mobile application for hypertension management, for patients to log and view their blood pressure record.

We target to deploy HealthCap in general outpatient clinic under Hospital Authority for blood pressure monitoring such that patients can record their blood pressure in HealthCap, while doctors can view patients' blood pressure data on an online portal where all data is synchronized.

LOOKING FOR:

- Funding
- Partners
- Product Feedback
- Visibility and Exposure

Website:
https://www.deephealth.com.hk/

Interested to know more about how CUHK innovation is being commercialised?

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www.alumni.cuhk.edu.hk/cuhkeday

HandyRehab

Mr. Alvin CHEUNG
CUHK Graduate
(2016 / Chung Chi College / Integrated BBA)

HANDYREHAB
Affordable robotics for rehabilitation

Affordable robotics for upper limb rehabilitation

STAGE OF DEVELOPMENT:
Growth & Scaling

DISTINGUISHED FEATURES

- A lightweight and a wireless robotic glove that is patented and clinically proven to assist stroke rehabilitation to up to 90% of full motor control
- A portable assistive device which helps disabled people to complete daily tasks, such as holding on a glass of water
- Use a smart EMG sensor to interpret the user's intention of movement and provide assistive force whenever necessary
- Provides both passive and active training
- One of the world's lightest robotic gloves, which is 50% lighter than a close competitor
- Wireless and portable design: suitable for upper limb training
- Affordable: Cost 1/3 the price of our competitors

RESPONSE TO MARKET PAIN POINTS
We are dedicated to tackling the problem of healthcare accessibility by developing affordable robotic devices for rehabilitation. For years, robotic rehabilitation devices have been designed for hospital settings. They are, in general, large in physical size, extremely expensive and, thus, not suitable for community or home use.

As most stroke rehabilitation takes place in the communities, disabled stroke survivors are in great desire for accessible robotic rehabilitation technologies. Therefore, we develop an affordable and portable robotic device for hand function rehabilitation in communities and households.

LOOKING FOR:

- Funding
- Partners
- Visibility and Exposure

Website:
https://www.handyrehab.com

Health View Bioanalytic Limited

Prof. Benny ZEE
JC School of Public Health and Primary Care
The Chinese University of Hong Kong

Automatic Retinal Image Analysis (ARIA) is a fully automatic algorithm built on the cloud internet platform.

STAGE OF DEVELOPMENT:
Launched

DISTINGUISHED FEATURES

Features of ARIA

- It provides fast and convenient risk assessment of stroke. No blood sample is needed. It can be used by those who are health conscious and would benefit from an initial stroke risk assessment.

(1) ARIA-stroke risk

- Assess the risk of stroke using Automatic Retinal Image Analysis
- Report would be generated in 5-10 minutes in the cloud system
- Achieved more than 90% sensitivity and specificity
- A health promotion tool for use in the community
- Primary prevention of stroke is an important strategy both for saving lives and reducing disabilities

(2) ARIA-eWMH (estimated White Matter Hyperintensities)

- Assess the risk of severe age-related white matter hyperintensities (ARWMH) in the brain based on automatic retinal images analysis (ARIA)
- Using cerebral magnetic resonance imaging (MRI) as the gold standard
- Achieved more than 90% sensitivity and specificity
- Report would be generated in 5-10 minutes in the cloud system

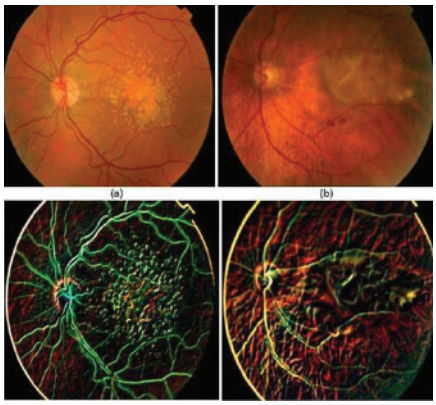
RESPONSE TO MARKET PAIN POINTS

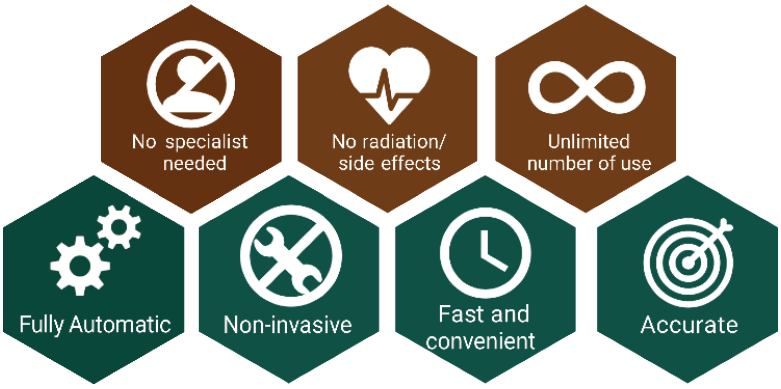
ARIA risk assessment is a health promotion tool for use in the community. Primary prevention of stroke is an important strategy both for saving lives and reducing disabilities. If used properly in the community, it would translate into major health care expenditure saving for the public health care system. There are several steps in the prevention strategy. First, the risk of stroke for an individual should be assessed. Second, prevention methods specific to the individual at risk should be given. Third, reassessed the risk of stroke to determine if the prevention methods are effective to the individual.

LOOKING FOR:

- Funding
- Partners
- Product Feedback
- Visibility and Exposure

Website:
https://www.healthviewbio.com/





Interested to know more about how CUHK innovation is being commercialised?

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www.alumni.cuhk.edu.hk/cuhkeday

Rice Robotics Limited

Mr. Victor LEE
CUHK Graduate
(2013 / Graduate School / Juris Doctor)

RICE ROBOTICS

Rice Robotics is building the software and hardware infrastructure to help the next generation of businesses deploy autonomous robots at scale.

STAGE OF DEVELOPMENT:
Growth & Scaling

DISTINGUISHED FEATURES

- Elevator integration
- Crowd navigation
- Customisable software
- 4G/5G enabled

RESPONSE TO MARKET PAIN POINTS
As our robots patrol around public spaces and we work tightly with building facility management teams, our robots are equipped with advanced sensors such as puddle detection and air quality monitoring systems to bring building management insights to our clients and the market.

LOOKING FOR:

- Funding
- Partners
- Product Feedback
- Visibility and Exposure

Website:
https://www.ricerobotics.com/

CUHK 中大創新日 2021
INNOVATION DAY 2021

INNOVATION, PATENTS AND BEYOND

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香港中文大學
The Chinese University of Hong Kong

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www2.orkts.cuhk.edu.hk

Supporting Organisations:

數碼港 Cyberport

HKSTP 香港科技園