Faculty of Engineering
THE UNIVERSITY OF HONG KONG

Faculty of ENGINEERING
NEWSLETTER
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Big attempts at micro level

While many regard studying samples under the lens of a microscope as a routine for scientists, new tools have emerged for researchers to carry out their work.

A professor in Mechanical Engineering, Anderson Shum Ho-cheung conducts experiments by manipulating fluids microscopically, in what is known as microfluidics.

At HKU’s Microfluidics and Soft Matter Laboratory, Professor Shum has taken the lead in doing research via droplet- and jet-based platforms since returning to Hong Kong in 2010 from the US, where he obtained his doctoral degree at Harvard University. So far, he and his team have filed patents for 12 inventions and licensed 6 of them.

The study of fluids delivered via tiny microchannels have great potential for drug delivery and biochemical reactions. Traditionally, water-oil solutions are used to encapsulate active ingredients such as drugs, components for food and beverage, etc., but one problem with that is many of the sensitive but effective active ingredients are sensitive and can be easily damaged in the presence of oil. Professor Shum has addressed this problem by looking into replacing the water-oil interface with pure aqueous solutions.

“Our research group was among the first to make the move. We tried and made it possible through a lot of fundamental investigation,” said Professor Shum, who did his undergraduate study at Princeton University.

“We came up with new techniques to control the breakup of the “water-water” system into control droplets. If we can introduce a new type of processing that does not involve oil at all, then it opens up a new possibility for some drugs or ingredients that may already be developed but could not be delivered due to incompatibility with oil.”

Prospects for wide application

Results of the microfluidics research can be applied across a wide spectrum of areas from clinical oncology, biological sciences, biomedical sciences to cosmetics. An emulsion expert, Professor Shum, has produced a new type of protein-based capsule, droplets capable of dividing into smaller droplets thereby mimicking biological cells, and electrified liquid jets with potential impact in printing and the formation of nanofibers.

His research efforts have won the support of funding agencies and industries from the biomedicine field in hopes of developing even more effective drugs.

Renowned chemical and biomedical companies are the major collaborators that his team has worked or is working with, besides Harvard University, Princeton University, and Tsinghua University.

Also pivotal is funding from the University Grants Committee’s Research Impact Fund (RIF), created to encourage research by local academics to deliver benefit for the community, as well as the government’s Innovation and Technology Fund.

The above support lessens worries about continuity of research. Professor Shum acknowledges the huge commitment and lengthy time involved in progressing from preliminary research to the advanced stage of human or clinical trials, in the case of drugs and cosmetics research. “The economic climate can affect whether companies are willing to continue to invest in our endeavour. But the Innovation and Technology Fund and RIF help bridge some of the funding gaps and lower the risk to companies.”
Promoting career development

Professor Shum is also more than happy to help his former students and colleagues identify career niches in the process of doing research.

He said one of his former students has set up a startup company serving the food and beverage industry applying technology derived from their research. The target is to commercialize results achieved at some stage of a lengthy explorative process.

“Each step of a research process can lead to different outcomes; if some students can identify some sparks, I encourage it. If someone believes in the value of a discovery and decides to build a career on it, I would support it,” he notes.

Regardless of the time involved, Professor Shum himself is driven to find solutions for collaborators, be it industry or other parties in need. “Whenever we are able to help with what we have already developed, we will not shy away from offering help,” he says. “It is important for the society to benefit from research achievement in both the short and the long term. The society cannot afford to have all researchers focusing on only short-term outcome. And in trying to solve long-term problems, a lot of skills and techniques need to be developed. Many of the skills and techniques developed along the way can help address some short-term problems.”

Multidisciplinary pursuits

He also stresses the necessity to be open to knowledge from other disciplines. One finds computer, engineering, chemistry, physics or biology graduates working in his lab. Together they contribute different angles to the problem, or help one another have a better understanding of other fields. “Sometimes this is very helpful for finding the best solution or identifying the right question to ask,” said Professor Shum.

In the field of microfluidics, knowledge of mechanical engineering is important, for example, in developing new platforms that combine pumps, or creating high voltage power supply to charge liquids.

Professor Shum adds: “We have to understand the fundamental physics very well too in order to develop feasible, effective approaches to handle the liquids.”

The need for multidisciplinary knowledge is a trend for research in all fields, not just engineering alone. “Like sustainability, it is a problem that can never be completely solved; for example, other problems will arise once you have tackled that of water shortage. You always need to take a multidisciplinary approach in solving big problems.”

Ranked among the top 1% of the Highly Cited Researchers in 2018 by Clarivate Analytics, Professor Shum has another interest - to promote a passion for innovation and technology among local youth.

He is both founding and executive committee member of the Young Academy of Sciences of Hong Kong established last year. Comprising scientists from various local universities, the academy organizes talks at secondary schools and arranges members to be mentors for students to enlighten and nurture future talents among other efforts.

Professor Shum’s recent achievements:

- Young Scientist Award in the Microsystems and Nanoeengineering Summit 2019
- One of the awardees of Excellent Young Scientist Fund (Hong Kong and Macau) 2019 by The National Natural Science Foundation of China
- Croucher Senior Research Fellowship 2020-2021
- Ton Duc Thang University Scientific Prize-Rising Star Award
Finding causes and effects

A pioneering researcher in quantum information science, computer science Professor Giulio Chiribella opened the door to an exciting new development in the realm of artificial intelligence.

Latest research by him and his student Daniel Ebler, published in *Nature Communications*, shows a powerful advantage of quantum algorithms over all classical algorithms in discovering cause-effect relations, a task that has countless applications in science and technology. Determining if a treatment causes recovery from an illness, identifying which gene is responsible for a certain hereditary condition, or establishing the causes of global warming are just a few examples of applications where cause-effect relations play centre stage.

"Classical algorithms for testing cause-effect relations are widely used in statistics and artificial intelligence. The mathematical framework underpinning such algorithms is relatively recent, and dates back to the work of Judea Pearl and collaborators in the 1980-1990s. The importance of this work was recognised in 2011, when Pearl received the Turing Award, the highest distinction in computer science," said Professor Chiribella. "Recently, researchers around the world started thinking how to extend Pearl’s framework to new scenarios governed by the laws of quantum mechanics."

Quantum mechanics is one of the most fundamental theories of physics. It describes nature at the smallest scales of atoms and subatomic particles. Professor Chiribella’s team addressed the challenging question of how to discover cause-effect relations in the world of quantum particles.

"How one quantum variable affects another quantum variable, and how to establish their cause-effect relation are exciting questions and they were completely unexplored until just a few years ago," added Professor Chiribella.

Quantum revolution

For centuries, physics has developed along the conceptual framework laid down by giants like Galileo Galilei and Isaac Newton. This framework, classical physics, describes accurately most of the phenomena we see in our everyday life. But if we zoom in to the level of atoms and particles, a new range of phenomena starts to emerge. “Everything we see around us is made of quantum particles, and their behaviour is governed by laws that are radically different from the classical laws posited by Galilei and Newton. If we want to understand the universe we live in, quantum mechanics is indispensable.” The rise of quantum physics, started a century ago, has not only been a revolution in science, but also a revolution in engineering. "Quantum mechanics is at the basis of some of today’s most used technologies, such as transistors and lasers, and a new generation of quantum technologies is currently under way. In the past 40 years, our technology has developed to the point that we can manipulate information at the level of individual quantum particles," Professor Chiribella explained. "We can now write a message in the state of a single photon, a particle of light. Continuing in this direction, in the future we will be able to communicate and process information using quantum particles. This will make our communication infrastructure more secure, and our computers faster."
Causality has been a very important concept since the beginning of modern science and engineering, but it was only when Pearl and coworkers came up with a mathematical theory in the 1980-1990s that it became a scientific discipline of its own.

Pearl’s work was inspirational to Professor Chiribella, who was doing research on how the fundamental laws of quantum mechanics can be turned into advantages for future information technologies. “When I found out about Pearl’s ideas on causality, I immediately wondered whether quantum mechanics could give us new, faster ways to discover cause-effect relations.”

His team discovered that a puzzling feature of quantum mechanics, known as quantum superposition, can indeed speed-up the discovery of cause-effect relations. Roughly, the idea is to perform many tests at the same time, making them interfere with each other. Exploiting the interference of multiple tests, is possible to increase the probability of correctly guessing whether a variable causes another variable. A quantum algorithm based on this principle can identify cause-effect relations much faster than every classical algorithm.

“Our result is only scratching the surface of a vast range of applications of quantum algorithms to the new science of causality,” says Professor Chiribella. Like Pearl, he believes that the ability to exploit the causal relationships between different variables is the future of AI. “The next level of research in AI is to enable machines to reason in terms of causes and effects, so that they can come up with the right sequence of actions to obtain a desired outcome. This complex reasoning will be based on the ability to identify and exploit causal relations among many variables,” Professor Chiribella said.
The virtual reality (VR) and artificial intelligence (AI) expert, who is also Associate Professor and Associate Dean of Engineering (Innovation) at the Faculty of Engineering, is driven to continue his exploratory journey, knowing that much more await to be developed in the realm of VR and AI. And further scientific insights could open up a whole new world imagined by humans.

Dr. Lau himself is tackling a number of current issues and challenges. Among them is the prevention of cyber sickness caused by using VR devices such as wearing of a head-mounted device that allow people to immerse themselves in virtual environment. “We have published papers on the cause of the dizziness, probably the lack of visual cue of objects, or frame of reference,” he said. As part of the research, he and his team at the Department of Industrial and Manufacturing Systems Engineering is collaborating with the university’s psychology department to improve on human computer interface.

Indeed, the scope of related research is immense, not just in relation to curbing physical or psychological discomfort alone. And often it involves collaboration with multiple disciplines, since both AI and VR are increasingly being deployed in wide-ranging areas, from healthcare, education, transportation to entertainment.

Even before the notion of augmented reality became popular, engineering savvy Dr. Henry Lau Ying-Kel of the Department of Industrial and Manufacturing Systems Engineering had spent years researching the creation of virtual worlds.

Award-winning solution

A brainchild of Dr. Lau’s team, the imseCAVE VR system has been adopted for the training of nurses, police officers, airline operation staff etc., earning it the Knowledge Exchange Award offered by the Faculty in 2016. Through the projection of realistic images on three walls, it enables people to see and interact with systems and scenarios in a virtual manner, in a full body immersive and high-fidelity 3D experience. It also provides a versatile, flexible and cost-saving platform for industry, business and education sectors for training, skill-evaluation, and system analysis.

“By deploying motion tracking system or AI software that captures real-time movements, we can track the progress of learners in training sessions, and obtain their behavioral profile to see if they have followed the standard procedures.”

Various versions of the system won a silver award in the category of Best Digital Entertainment Award (Interaction Design) in the 2015 Hong Kong ICT Award and a Silver Medal in the 47th International Exhibition of Inventions of Geneva in 2019. “We are already using the 6th, 7th generation of the system and have seen the birth of 3 spinoff companies marketing the product,” said Dr. Lau, “In our collaboration with the HKU nursing school, we produced the VR content for student training and used the system as a platform to study how nursing students react to the content, what are the technological issues that need to be resolved as well as the psychological effect on the learners.”

“Want to help people have more natural interactions with VR,” he added. “There is much room for research. Many projects only focus on technology thus far, say in creating better display, higher resolution, faster computer, brighter screen etc., but there are other issues like the long-term effect of exposure to VR on our eyes, which means researchers would need to work with eye doctors.”
Contributing to the science of robotics

Worldwide, efforts are underway to optimise systems of automation, such as driverless vehicles or the increasingly prevalent robots. Prior to joining HKU in 1997, Dr Lau was a Senior Systems Engineer at the UK Atomic Energy Authority (UKAEA) and the AEA Technology PLC, specializing in tele-robotics systems and advanced automation systems for the nuclear industry.

While teaching engineering science at Oxford University, Dr Lau and his research group worked on robotics using AI, and new technology such as the now increasingly well-known machine learning system.

A natural-born engineer

When he was a child, he stood out not just for his outstanding academic results but also for a knack for making objects with his own hands. "I just love machines and fixing problems. In primary schools I like dismantling everything, even a chair."

"When I was studying in high school in England, my math teacher asked me to do math at university but I said I wanted to go into engineering. He was disappointed."

Rather than the traditional fields of mechanical or civil engineering, he chose to specialise in industrial engineering (IE). That led to his longstanding exposure to the industrial world.

"IE looks at the holistic aspect of engineering, including design, management, system operation; we call ourselves systems engineers," he said. He and his counterparts are used to creating models of the distinct work situation in a particular company, doing analysis on it before devising a management plan that would enhance the company's efficiency, performance or result in saving costs.

Probable because it does not involve going out to construction sites, IE has proven to be most popular with female students compared to the other branches of engineering. "A good portion of students in our discipline are ladies, and our department has one of the highest percentages of female enrollment in the Faculty," said Dr Lau.

There is no doubt about the value of his field from an economic point of view. "IE is not supposed to create for example the circuit inside a smartphone but rather the whole supply chain, the best phasing, optimization of resources," he added.

A Calling for the young

The field of AI is even indispensable as more and more companies seek to maximise gains and efficiency through digital means.

Engineers could generate previously unthought of solutions through mining, capturing and integrating data. For example, says Dr Lau, there is the possibility of creating buildings designed for robots, or intelligent robots capable of detecting changes in an environment.

"AI came from trying to look at pattern, statistics, past experience and find the best match of practices. The jobs of conveyance lawyers, doctors, accountants could disappear soon because cloud-based big data can lead to much better diagnosis than that provided by them," he noted.

Along with all the hype about STEM education in Hong Kong, he hopes more local youngsters can pursue the challenging path as he did, rather than being well-contented with the comfortable modern living. There are indeed pressing issues that require urgent input of thinking and action.

"Our energy source such as fossil fuel is running short, there are also the ongoing issues of air pollution, depleting of drinking water, population increase, etc."

"Engineers are not pure scientists, but people who like to solve problems, produce innovative solutions; their role is to find workable and practical solutions that help improve people living standard and benefit the society."
Highly Cited Researchers of 2019 by Clarivate Analytics

Each year, the Web of Science Group identifies the world’s most influential researchers who have been most frequently cited by their peers over the last decade. In 2019, less than 6,300, or 0.1%, of the world researchers, across 21 research fields, have earned this exclusive distinction. Among the thirteen academics of the University of Hong Kong being named “Highly Cited Researchers of 2019” by Clarivate Analytics, five of them are from Engineering:

**Category: Environmental and Ecology**
Professor Zhang Tong, Department of Civil Engineering

**Category: Engineering**
Professor James Lam, Department of Mechanical Engineering

**Category: Cross-Field**
Professor Yiu Siu-ming, Department of Computer Science

**Category: Computer Science**
Dr Kaibin Huang, Department of Electrical and Electronic Engineering

Top 1% scholars at HKU

This list recognizes HKU researchers ranked by Clarivate Analytics in the top 1% worldwide by citations in at least one of the 22 research fields. Data is drawn from Essential Science Indicators (ESI). Among the 119 HKU colleagues on the list for the year of 2019, 28 (23.5%) are from the Faculty of Engineering.

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Dr Tony Feng Shien-ping of the Department of Mechanical Engineering and his team invented a Direct Thermal Charging Cell (DTCC) which can effectively convert heat to electricity, creating a huge potential to reduce greenhouse effects by capturing exhaust heat and cutting down primary energy wastage.

The new invention was published in the prestigious journal Nature Communications, and the research has been featured in the Nature Communications Editors’ Highlights webpage. HKU’s Technology Transfer Office has filed for the invention’s US provisional patent and PCT (Patent Cooperation Treaty) patent.

Low grade heat is abundantly available in industrial processes (80 to 150°C), as well as in the environment, living things, solar-thermal (50 to 60°C) and geothermal energy. Over 60% of the world’s primary energy input, whether it is in the industrial process or domestic energy consumption, is wasted as heat. A majority of this loss as waste heat is regarded as low-grade heat.

The newly designed DTCC is a game-changing electrochemical technology which can open new horizons for applications to convert low-grade heat to electricity efficiently. It is a simple system with the basic unit sized only 1.5 sq.cm and thickness 1 to 1.5 mm. The cell is bendable, stackable and low cost.

DTCC can be used in HVAC (heating, ventilation, and air conditioning) system to recycle low-grade heat from the compressor and condenser into electricity for use in electrical devices. It can be integrated with the window frame to harvest solar thermal energy to power electrochromic windows, or used as portable devices to power iPhones or life-saving equipment in the wilderness. With the increasing popularity of wearable technology, this system may one day harness body heat to power wearable electronic devices or medical devices for monitoring body health conditions like blood sugar levels and blood pressure.

Dr Feng said: “Efficient low-grade heat recovery can help to reduce greenhouse gas emission but current technologies to convert this heat to electricity is still far from optimum. DTCC yields a conversion efficiency of over 3.5%, surpassing all existing thermo-electrochemical and thermo-electric systems, which is either too costly or complicated, or too low in efficiency for everyday applications. DTCC is a revolutionary design with great potentials in smart and sustainable energy devices.”

The new thermal charging cell uses asymmetric electrodes: a graphene oxide/platinum (GO/Pl) cathode and a polyaniline (PANI) anode in Fe2+/Fe3+ redox electrolyte via isothermal heating operation without building thermal gradient or thermal cycle. When heated, the cell generates voltage via a thermo-pseudocapacitive effect of GO and then discharges continuously by oxidizing the PANI anode and reducing Fe3+ to Fe2+ under isothermal heating on cathode side till Fe3+ depletion. The energy conversion works continuously under isothermal heating during the entire charge and discharge process. The system can be self-regenerated when cooled down. This synergetic chemical regeneration mechanism allows the device cyclability.

The team was selected as one of the 16 finalists out of 300 applications and one of the only two finalists in Hong Kong competing in the Hello Tomorrow Regional Summit 2019 in last November, a competition for start-ups to adapt their research for real-world commercial uses.

The invention has won the Championship in the HKU 2018 DreamCatchers 100K Entrepreneurship Competition. The team has established a start-up company, High Performance Solution, which is aided by the Technology Start-up Support Scheme for Universities (TSSSU). The company also joined the Incu-Tech 3-year programme at the Hong Kong Science Park and received its first revenue from the prototypes. The team has participated in the first X-plan roadshow of Talent Development Forum in Great Bay Area held by the Hong Kong X Foundation. It has also taken part at the Entrepreneurship forum in Bahrain, Middle East. The team recently won a silver award at the 2nd Asia Exhibition of Inventions Hong Kong (AEI) as well.
Funding from MOST National Key R&D Programmes in developing new alloys

Professor Huang Mingxin of the Department of Mechanical Engineering has secured RMB11.07M funding in the second round of the National Key Research & Development Programmes (NKPs) of the PRC’s Ministry of Science and Technology (MOST) that is open for researchers in Hong Kong and Macau.

To encourage cross-region innovation and technology collaboration, scholars from Hong Kong and Macau were eligible since 2019 to apply directly to the Ministry's National Research & Development Program for funds that could be used to support for the research conducted in Hong Kong. This scheme offers substantial funding for key and strategic research technologies.

Professor Huang will lead a team of researchers from HKU, the Chinese Academy of Sciences, Dalian University of Technology and Xi’an Jiaotong University whose expertise in the areas such as metallurgy, mechanics, nuclear technology and ab-initio calculation to develop new nanostructural high entropy alloys that have the potential for application in extremely low temperatures or in nuclear power plants.

Professor Huang has both industrial and academic experience in working with metals and alloys. He has led a Beijing-Hong Kong-Taiwan mechanical engineering team developed a Super Steel (also called D&P Steel) which addressed the strength-ductility trade-off with the material cost just one-fifth of that steel being used in the current aerospace and defence applications. This research breakthrough was published in the prestigious journal Science in 2017 and brought him the Global Innovation Award at TechConnect World Innovation Conference & Expo in 2018.

“We have always been actively looking for funding opportunities beyond Hong Kong. When we saw the call for proposals, we felt that our research expertise fits very well with the programme. So we decided to give it a try. We are very happy to be awarded and we want to demonstrate that HKU’s expertise can also make important contributions to the national Key R&D projects,” Professor Huang said.

Dean Christopher Chao is pleased to learn the result, “We have many world-class researchers that are ready to make an impact to the world. Professor Huang's success in getting this funding will definitely encourage other researchers to be more active in applying the funding in national-level.”

Interactive learning platform acquired by Hailiang Education Group

Versitech Limited, the wholly owned technology transfer arm of the University of Hong Kong, and Hailiang Group signed a Memorandum of Understanding on September 3, 2019, for the sales agreement of the iClass LMS Interactive Learning Platform. This software was developed by the e-Learning Development Laboratory of HKU. It will be enhanced, marketed and operated by Hailiang Group.

The iClass Cloud-based Interactive Learning Platform technology was developed by Dr Wilton Fok and his team in the Department of Electrical and Electronic Engineering. It was initially developed for the e-learning classroom in those reconstructed schools after the Sichuan earthquake in 2008. Then iClass was deployed not only in HKU but also many other schools in Hong Kong, Mainland China and overseas for interactive e-learning. Students can interact with teachers through the cloud network with different mobile devices. Functions like multimedia, big data and intelligent assessment are supported. This technology received the Hong Kong Information and Communication Technology Award and the National Internet Plus Start-up Award.

The Chairman of Hailiang Group Mr. Feng Hailiang said: “We appreciate the technological innovation and advancement of the HKU R&D team. Under the policy driving force of Internet Plus Education, we believe that our collaboration will be a good model for the development of IT in education for our country.”

In the future, HKU and Hailiang will capitalise on their own strengths and continue to strategically collaborate in some new areas in online learning and IT in Education, such as artificial intelligence, educational big data, intelligent question bank and student development activities. The collaboration will make good contributions to the technology education for the Greater China and the world.
Support from TSSSU @HKU for engineering start-ups

TSSSU@HKU is an award scheme that provides funding support to technology start-up companies formed by HKU members. This is leveraging on a funding scheme, “Technology Start-up Support Scheme for Universities” (TSSSU), provided by the Innovation and Technology Commission (ITC) for the six local universities, under which ITC will provide each university an annual funding of up to HK$4 million to encourage technology start-ups. Companies awarded under the scheme will be funded for no more than 3 years with a maximum amount of HK$1.2 million per year. Four start-up companies established by Professors, students or alumni of the Faculty of Engineering are among the TSSSU@HKU Awardees in 2019/20.

Company: Brain Investing Limited
Founder: Professor Yiu Siu-ming, Department of Computer Science
Business: All-in-one FinTech solutions based on artificial intelligence technologies

Company: Novel Sonics Limited
Founder: Dr Lee Wei-ning, Department of Electrical and Electronic Engineering
Business: Novel ultrasound imaging techniques for economical, real time and invasive diagnosis of Cardiovascular diseases

Company: High Performance Solution Limited
Founder: Dr Tony Feng, Department of Mechanical Engineering
Business: Thermo-electrochemical capacitor (TEC) for converting low grade wasted heat into electricity

Company: InterLitho Technology Limited
Founder: Dr Wendi Li, Department of Mechanical Engineering
Business: InterLitho uses fiber-optic interference lithography technology and its sensing applications to develop nanolithography and nanofabrication equipment

Top 10 Healthy Mobile Phone / Tablet Apps

Developed by Dr Beta Yip Chi-lap and Dr Ivy Wong Ka-yan of the Department of Computer Science, a mobile app “HKcBirds Common Birds of Hong Kong” was selected as one of the “Top 10 Healthy Mobile Phone/Tablet Apps” in the 2018 Meritorious Websites Contest Healthy Mobile Phone/Tablet Apps Contest.

The app is the first cross-platform information app in Hong Kong which allows users to access multimedia information of common birds in Hong Kong. It was a collaboration between the Department of Computer Science and the Hong Kong Bird Watching Society and was supported by the HKU Knowledge Exchange Fund in 2013/14.

The contest, which was organized by the Office for Film, Newspaper and Article Administration, aims to encourage young people to browse healthy websites and recognise the contributions of healthy websites producers and Apps developers.
Artificial intelligence for swimmer safety

Dr Wilton Fok of the Department of Electrical and Electronic Engineering and his team was awarded HK$3.9M from the Innovation Technology Fund Better Living Fund for the development of Artificial Intelligence for Drowning Detection and Swimmer Performance Analysis System. The technology will be deployed in the new swimming pool in Munsung College and Fung Kai No.1 Secondary School.

With the help of artificial intelligence, computer vision, human pose estimation algorithm and deep learning, an AI system is expected to be implement in swimming pools to analyse swimmers' posture for drowning detection. Surface or underwater drowning situation could be detected by ceiling cameras and underwater pool-side cameras. The swimming posture motion data could be analysed for the improvement of swimmers' performance.

Dr Fok said, "With the help of this system, not only the safety of swimming pools can be enhanced, but also fosters the artificial intelligence research development for human posture analysis."

“Innovating Higher”, an international conference on Modular Integrated Construction

Modular Integrated Construction (MiC) is a game-changing disruptively-innovative approach that transforms fragmented site-based construction of buildings and facilities into integrated value-driven production and assembly of prefinished modules. Given the opportunities brought by MiC in achieving enhanced quality, productivity, safety and sustainability, MiC is a timely solution to address the challenges faced by the HK construction industry, e.g. labour shortage, aging workforce and high building cost.

The HKU Centre for Innovation in Construction & Infrastructure Development and the Hong Kong Real Property Federation jointly organised an international conference on MiC titled “Innovating Higher” at Hong Kong Convention and Exhibition Centre on August 27, 2019. The conference aims to share the state-of-the-art knowledge and practice of high-rise modular buildings internationally to the wider construction industry and community in HK. The sharing focused on innovative solutions for addressing higher-rise, higher-density, higher-tech and higher co-creation.

The conference featured internationally-renowned experts in modular construction from governments, industries and academia in the UK, Singapore, Canada, Australia, Mainland China and Hong Kong, as well as two plenary sessions by the project teams of the tallest modular buildings in the world, i.e. the 44-storey steel-framed modular building in London and the 40-storey precast concrete modular building in Singapore. Insights are shared on advanced structural engineering, smart supply chain management, and digital transformation.
Worldwide collaborative efforts in tackling antibiotic resistance

Antibiotic resistance (AMR) is an emerging environmental concern in the international agenda which is threatening public health and sustainable development. In recent years, it has been increasingly recognised across society, including scientists, doctors, engineers, governments and the general public. According to the UNEP Frontiers 2017, AMR was listed as one of the six emerging issues of environmental concern. Effectiveness of policies and actions to combat AMR rely on the understanding of the problem including factors driving the development of AMR; assessment of the global scope and nature of the problem; and identifying the most effective mitigation and stewardship practices.

At The University of Hong Kong, academics from the Department of Civil Engineering, School of Public Health, School of Biological Science, Department of Chemistry, Faculty of Law and Faculty of Social Science collaboratively formed an AMR team, making the University a regional and global center on AMR research.

Joint research centre to promote the development of smart transport system in the Greater Bay Area

The University of Hong Kong and the Hong Kong-Zhuhai-Macao Bridge Authority signed a strategic collaboration agreement and jointly established the Guangdong, Hong Kong and Macao Greater Bay Area Transport Construction and Intelligent Maintenance and Safety Operation Engineering Technology Research Centre with universities, research institutes and enterprises in the Greater Bay Area, with the aim to deepen collaboration on the operation and maintenance of large-scale transport infrastructure in order to promote technological advances in transport infrastructure.

The opening ceremony of the Engineering Technology Research Centre was held on November 16, 2019 in Zhuhai. HKU Associate Vice-President (Research) Professor Mai Har Sham attended the ceremony together with the interdisciplinary team including Head of Department of Civil Engineering Professor Francis Au and professors from Department of Urban Planning and Design and Department of Real Estate and Construction.

HKU’s interdisciplinary team at present is mainly involved in the study of space-time characteristics of the Hong Kong-Zhuhai-Macao Bridge’s cross-border travel and the development of intelligent transport planning system. It is also participating in the study of intelligent virtual reality, real-time monitoring, prediction and early warning of structural breakdown of the bridge. Both HKU and the Hong Kong-Zhuhai-Macao Bridge Authority will jointly bid for research funding and promote technology transfer for related research results.
Reinforcing faculty-level connection with Tohoku University

Further to the academic agreement which had been jointly signed by The University of Hong Kong and Tohoku University in March 2019, Dean Christopher Chao led a delegation to visit the School of Engineering of Tohoku University for signing a Faculty-level Memorandum of Understanding (MoU) on exchange programme from year 2019-2020. With this agreement, HKU Engineering students can join the exchange programme to Tohoku University for a semester or full-year from Year 2 onward.

Professor Toshiya Ueki, the Executive Vice President for General Affairs, Financial Affairs and International Relations, and Professor Masahiro Yamaguchi, Vice President for Education Reform and Global Engagement, met with the HKU delegation to reinforce the connection between the two universities.

After the MoU signing, the delegation took the opportunities to visit various research laboratories in Tohoku University. To highlight a few, the group was introduced to the light-weight grippers with minimal servo motors; grippers being able to grab soft and hard objects; robot assistant who can work around human user or dance with human partner and so on. The delegation also met with the research group funded by the ImPACT Programme of the Japanese government which focuses on the development of new robots for disaster response and recovery. The delegation also had the chance to reach out to various research teams of the School of Engineering in Tohoku University including those which are working on tribology, city ventilation modelling, energy-saving cooling materials, disaster mitigation after tsunami, and water resources monitoring and policy response.

Eye-opening visit to Hong Kong Science Park

An Engineering delegate consisted of professorial and research staff as well as postgraduate students visited the Hong Kong Science Park in last September. The visit was kick-started with a workshop which offered a comprehensive update on the technological and facility development of Hong Kong Science and Technology Parks Corporation (HKSTP), especially in the areas of information and communication technologies, microelectronics, artificial intelligence and robotics, sensors, 5G communication and biomedical technologies. The delegate also had opportunities to learn more about the latest schemes introduced by HKSTP and the HKSAR government to support endeavors in innovation and technology.

Dean Christopher Chao shared the latest developments of the research foci and achievements in the Faculty. He encouraged more and stronger collaborations between the Faculty and HKSTP, which was echoed by the Chairman of HKSTP Dr Sunny Chai, Chief Former Executive Officer of HKSTP Mr Albert Wong and HKU Former Vice-President and Pro-Vice-Chancellor (Research) Professor Andy Hor. The workshop was followed by a networking session with HKSTP companies and laboratory visits, including the Smart City Innovation Centre, the Reliability Lab, the Failure Analysis Lab, the Probe & Test Electronics Lab and the Arrow Open Lab. Through dialogues and exchange of ideas, connections were established during the visit, which comes at a time when Hong Kong aspires to significantly develop innovation and technology.
Year 2019 marks the centenary of professional recognition of the Mechanical Engineering Bachelor degree programme of The University of Hong Kong by the Institution of Mechanical Engineers (IMechE) of UK since 1918. The Institution is licensed by the Engineering Council to accredit academic programmes and professional development schemes. The IMechE recognition of the ME programme back in 1918 was the first of its kind in Hong Kong and China, and one of the first even in the world. It was a very important, albeit rather unknown, monument for engineering education in our part of the world.

Professor Alfonso Ngan, Former Head of the Department of the Mechanical Engineering, met Mr Terry Spall, President-elect of IMechE, in Hong Kong on November 4, 2019, to celebrate this important centennial event. During the meeting, Mr Spall presented a certificate commemorating the milestone and a book “An Engineering Archive” to the Department.

Professor Ngan had conducted a research and written a paper related to the history and development of the earliest professional engineering education in Hong Kong. In this “treasure hunting” exercise, he discovered that the first attempt in applying for the degree exemption was declined.

“Professor Cades Alfred Middleton-Smith, the first dean of HKU Engineering, was a associate member of IMechE. He had been appointed as Dean of Engineering of the newly opened University of Hong Kong in 1912 and introduced the systems of honours classification and professional recognition a century ago. Under his leadership, we made the first application to IMechE to seek recognition of HKU’s Mechanical Engineering degree in 1916,” said Professor Ngan.

“However, that application from HKU for their matriculation examination to be included in the list of the examinations exempting from the graduateship examination of IMechE, was declined. A year later in 1917, Professor Middleton-Smith made a renewed application. The mechanical degree was eventually recognised as exempted from IMechE exams in 1918. This served as the starting point of our long-lasting relationship with IMechE,” Professor Ngan illustrated.

The interruption of war in 1941 slowed down the progress. Full accreditation was once again given to our mechanical engineering degree by IMechE in June 1962. This piece of interesting history could be found in an article which was published in the February issue of The Hong Kong Institution of Engineers (HKIE)’s Journal “Hong Kong Engineer” in 2018.

The status of the IMechE accreditation remained until 1997, when the role of the professional accreditation in Hong Kong was taken over by The Hong Kong Institution of Engineers. Currently, HKU Mechanical Engineering has more than 4,000 graduates with Bachelor degree that have full recognition by IMechE.

“We treasure this centenary recognition greatly. At HKU, we always thrive to provide qualified engineering education to students and it is our mission to nurture the future leaders in the field of engineering for making an impact to the society and the world.” Professor Ngan concluded.

William M.W. Mong Distinguished Lecture

The William M.W. Mong Distinguished Lectures in Engineering are organised to facilitate exchange of new ideas and developments in the field of engineering and to strengthen the ties between the industry and the University. In the second half of 2019, the Faculty was honoured to have “Father of 3D Transistors” Professor Chenming Hu of the University of California, Berkeley and Professor Jun Takeya of the University of Tokyo to share their insights on multi-disciplinary topics.

- Date: September 12, 2019
  - “Semiconductor - World Impact and Future Prospect”
  - Professor Chenming Hu, University of California, Berkeley

- Date: September 25, 2019
  - “Physics, Materials and Applications of High-mobility Organic Semiconductors and Flexible Circuit Applications”
  - Professor Jun Takeya, University of Tokyo
HKU presented Honorary University Fellowship to Mr Tam Wing Fan

The University of Hong Kong confers Honorary University Fellowships to distinguished individuals in recognition of their contribution to the University and the society every year. Mr Tam Wing Fan, who made a generous donation in establishing Tam Wing Fan Innovation Wing, was among the three distinguished individuals to be conferred the Fellowship in 2019. The Pro-Chancellor of the University Dr the Honourable Sir David Li Kwok-po presided at the presentation ceremony in last September and Mrs Tam Wing Fan received the Honorary University Fellowship certificate on Mr Tam’s behalf.

Mr Tam Wing Fan is a distinguished Hong Kong architect and philanthropist. He holds a Bachelor of Architecture degree from the University of Hong Kong, and was in the first cohort of students admitted in 1950 into the newly established Department of Architecture, which at the time was part of the Faculty of Engineering.

Mr and Mrs Tam Wing Fan made a generous donation to the Faculty of Engineering in establishing Tam Wing Fan Innovation Wing, an iconic state-of-the-art facility where students can expand their imagination and realise their ideas, in 2017. While this new iconic landmark is expected to be completed by 2020, Mr and Mrs Tam Wing Fan showed their continuous support to the Faculty by donating another HK$20M in establishing the Tam Wing Fan Innovation Wing Two in July 2019.

A priceless gift from 1923

The Faculty is pleased to receive a gift from Dr Ron Abraham, grandson of Professor D.C.H. Florance who was a Physics professor at HKU in the 1920s. The gift is a framed photograph of HKU Engineering Society dated February 1923. It also appears the first woman in the Faculty of Engineering and the Engineering Society. It is the oldest archive in the University which was related to the Faculty of Engineering.

Professor S.C. Wong, Associate Dean of Engineering (Development and External Relations), and Mrs Stacy Belcher Lee, Director of University Archives of HKU, were delighted to meet with Dr Ron Abraham and his wife Ms Susie Abraham at the University. Dr and Mrs Abraham were impressed by the interesting stories and the works of the University Archives.

HKU Engineering Society was established in 1913 and it is the oldest faculty-based society in the University of Hong Kong. It is now an affiliation to the Hong Kong University Students’ Union (HKUSU).
A student team led by the University of Hong Kong was awarded first runner-up at the Student Competition of 2019 Global Grand Challenges Summit (GGCS) in London September 2019, where 15 student teams from around the world competed on solutions that address the world's grand challenges in engineering.

The Hong Kong team won the competition with "ClearBot," an AI-powered, autonomous plastic-collecting robotic solution that took aim at the global ocean plastic epidemic.

The 2019 Global Grand Challenges Summit, co-hosted by the US National Academy of Engineering, the UK Royal Academy of Engineering, and the Chinese Academy of Engineering is the 4th in a series of biennial international event where world leaders, engineers, researchers, and entrepreneurs convene to share their views and innovations to sustain our future world. An important part of the GGCS is its Student Competition, where the best young engineering students from around the world address the questions "Can we sustain 10 billion people?" and "Will AI and other transformational technologies change humanity for the better?" with innovative solutions.

The HKU team first won the local competition organised by the Hong Kong Academy of Engineering Sciences (HKAES) among five universities from Hong Kong in June 2019 with an early prototype of "ClearBot." The HKU team, comprised of Angel Woo Chung-yu (BEng(CompSc)), Utkarsh Goel (BEng(CompSc)), Ahmed Abbas Alvi (BEng(ME)), Ma Jiachen (BSc(ActuarSci)) and Sidhant Gupta (BEng(CE)), was coached by Dr Hayden Kwock-Hay So of the Department of Electrical and Electronic Engineering through the support of the Tam Wing Fan Innovation Wing and the Gallant Ho Experiential Learning Fund. Upon winning the local competition, the HKU team was joined by Padmanabhan Krishnamurthy from the Hong Kong University of Science and Technology and Theresa Yip Man Yee from the City University of Hong Kong to form a joint University Team of Hong Kong under the direction of Dr So to compete as one of the China teams on the world stage.

The award-winning project, "ClearBot," represents a truly multi-disciplinary solution that puts heavy emphasis on the relationship between technology and the people who are most affected by this plastic epidemic. From the initial experiential learning trip to Bali, to the open-source software/hardware development model, the development of "ClearBot" remains hinged on the belief that real-world impact can only be achieved by engaging the target communities at every step.

Dean Christopher Chao was delighted about the remarkable performance of the team. He said: "At HKU Engineering, we focus in nurturing students with an all-rounded development. Students are encouraged to acquire hands-on experience and equip themselves with a global outlook. We are delighted to see our students' achievements and growth in the international competition. The team truly demonstrated the power of collective wisdom."

Dr C.K. Chui, Director of Tam Wing Fan Innovation Wing, said: "We emphasise on student experiential learning. It is definitely a remarkable experience for our students. We would also like to thank our donors, including Mr and Mrs Tam Wing Fan, and our alumni for their supports throughout the project."

Professor Ching Pak-chung, President of HKAES, said: "HKAES strives to pursue, encourage and maintain excellence in the entire field of engineering to useful purpose in order to promote the advancement of the science, art and practice of engineering for the benefit of the public. We always fosters education and training of engineers. The student team had joined forces from various universities in Hong Kong and representing China in the national competition, We are proud to see their outstanding achievements in the GGCS 2019 Student Competition."
An overall third Place at maiden Formula Student Competition in UK

A huge applause to the HKU Racing Team for achieving a Second Place in the Class 2 Design Competition and an overall Third Place at their maiden Formula Student Competition!

HKU Racing Team was led by Luv Khanna (BEng(ME)) and joined by Ho Ho-man (BEng(ME)), Kurukulasuriya Vishmika Sachintha Fernando (BEng(ElecE)), Kenneth Hui Ka-chun (BEng(EE)), Ho Shui-ho (BEng(ME)), Mok Ka-chun (BEng(ME)), Jasper Yeung Chun-hong (BEng(ME)) and Yau Lai-ho (BEng(ME)). They competed with other 36 universities from UK, USA, France, India, Turkey and Egypt in the Class 2 Category in the Formula Student 2019 Competition which was taken place at the Silverstone Racing Circuit in July 2019.

Formula Student is the most established educational engineering competition in Europe. Organised by the Institution of Mechanical Engineers, the competition was sponsored by prestigious automobile companies such as Mercedes AMG High Performance Powertrain, BOSCH and MAHLE Powertrain. There are two entry classes in the competition where teams compete with the cars they design and build in Class 1 category. HKU Racing Team participated in Class 2, which was a static events included engineering design, cost & manufacturing and business presentation. Teams were required to have rigorous discussions with the judges on the vehicle design, project cost, manufacturing methods and the proposed business models. HKU Racing Team achieved a Second Place in design and seized an overall Third Place in the competition.

Team leader Luv Khanna remarked, "Formula Student provided us a valuable opportunity to get involved in motorsport-related project. It was a wonderful platform to be connected with professionals from the motorsports industry. We would like to thank the faculty advisors and the University in their continuing support in this project. We expect to build the entire vehicle and compete in the Class 1 category for 2020."

HKU Racing Team is the University of Hong Kong’s first ever racing team. Founded in September 2018, the team initially started off with 30 members and the numbers have been gradually increasing. Currently, we have about 40 members from the engineering discipline. They are supervised by Dr C.K. Lee, Dr C.K. Chan, Dr Match Ko and Dr C.K. Chui of the Faculty of Engineering.
Champion of Chengdu 80 - FinTech Design and Development Competition

A team of six undergraduates from Computer Science, Computer Engineering and Science crowned Champion at the Chengdu 80- FinTech Design and Development Competition held from October 29 to November 4, 2019 in Chengdu of China. UC Berkeley and National University of Singapore shared the second place.

The team was supervised by Professor Yiu Siu-ming of the Department of Computer Science and comprised of Waqas Ali (BEng(CompSc)), Utkarsh Goel (BEng(CompSc)), David Boli Han (BEng(CompSc)), Piyush Jha (BEng(CompSc)), Nitya Pendkar (BEng(CompEng)) and Li Hanfei (BSc).

Champion of Smart Cooling Challenge at Hack Asia 2019 in Singapore

A group of Mechanical Engineering undergraduates, Chan Ka-ho, Chan Ka-man, Cheng Yiu-him and Yum Ka-lok, won the Smart Cooling Challenge at Hack Asia 2019 in Singapore. More than 100 teams participated in this year Hack Asia and Smart Cooling Challenge was one of the six challenges of the competition. The Smart Cooling Challenge was sponsored by Hong Kong Land and was open to participants in South East Asia. Participating teams were required to develop new software and hardware solutions to help cool buildings more efficiently and sustainably.

After assessing the initial proposals, six teams were invited to participate in the two-day Hack Asia in Singapore in October 2019. During the hackathon, teams further developed their concept and were mentored by industry experts. Eventually, our team stood out from the competitors and received a SGD$2,500 cash prize.

First prize at China Pan-Pearl River Delta Region IT Project Competition 2019

Supervised by Dr Beta Yip Chi-lap, BEng(CompSc) students Jacky Mo Cheuk-yin (left) and Shaun Zhong Shun (right) participated in the China Pan-Pearl River Delta Region IT Project Competition 2019 with their final-year project "Virtual Music Tutor". They first won a First Prize in its regional competition in Hong Kong and was awarded a First Prize and the Most Creative Award in the final competition held in Macau in early July. Their project was one of the projects which are related to music in the competition, and the only one specifically about electric guitar.
Prizes at “Challenge Cup” National College Students’ Extracurricular Academic Science and Technology Contest

Zhang Yage (middle) received the First Class Award at the award presentation ceremony on November 20, 2019.

“Digital electro-microfluidics platform for manipulating liquid marbles and its applications” developed by Zhang Yage and Fu Xiangyu of the Department of Mechanical Engineering was among the two Hong Kong teams who won a First class Prize at “Challenge Cup” National College Students’ Extracurricular Academic Science and Technology Contest held at Beihang University, Beijing. In addition, “RoboCoach”, a project developed by a group of MSc students, won a Third class Prize in the contest.

“Challenge Cup” is a leading competition of curricular academic science and technology works for Chinese college students. Thirteen teams from universities in Hong Kong participated in the competition this year. Yage’s project provides a novel methodology to control the movement of the non-wetting droplets precisely and benefit applications, for instance, as micro-reactors on digital microfluidics platform for chemical and biological assays.

“RoboCoach” is an AI motion video analysis project developed by a group of MSc students, Carol Chen, Zhang Baohe Cheng, Oliver Xu Ao and Electrical Engineering graduates Louis Chen of the Department of Electrical and Electronic Engineering. Apart from winning a Third Class Prize in this contest, the team also won a bronze medal in the 5th China College Students’ “Internet Plus” Innovation and Entrepreneurship Competition held in Hangzhou.

Young Scholar Award and The Best Paper Award at 9th WACBE World Congress in Bioengineering

Ma Yichuan X., PhD student supervised by Professor L.K. Young of the Department of Electrical and Electronic Engineering, received Young Scholar Award and The Best Paper Award for a paper entitled ‘A spatial temporal model for decoding dynamic vision with convolutional neural networks’ at the 9th WACBE World Congress in Bioengineering.

The 9th WACBE World Congress took place from August 16 to 19, 2019, at National Taiwan University. It attracted about 400 delegates from all over the world, including academic researchers, industry practitioners, medical officers, business leaders and students.
“Student Innovation Prize” at CIC Construction Innovation Award 2019

Construction progress monitoring and control is one of the most significant tasks of construction management. However, current practices and tools mainly rely on manual checking and adjustment, which is labour-intensive and error-prone. To address these challenges, three young researchers of the Department of Civil Engineering proposed an augmented reality (AR) and computer vision (CV) integrated approach with an aim to monitor the construction progress automatically and accurately.

This project titled “Augmented Reality and Computer Vision Integrated Construction Progress Monitoring and Control: A Case of Modular Integrated Construction” was conducted by Dr Zhiqian Zhang, Wong Munon, Zheng Zhenjie and supervised by Dr Wei Pan and Dr S.H. Lee of the Centre for Innovation in Construction and Infrastructure Development. The team was awarded “Student Innovation Prize” at the Construction Industry Council’s Construction Innovation Award 2019 and an award presentation ceremony was held in December 2019.

Awards at Young Professionals Exhibition & Competition by Institution of Engineering and Technology

The Institution of Engineering and Technology organises Young Professionals Exhibition & Competition with an aim to act as a dynamic platform for prospective or young engineers from five different sections (Secondary School, Sub-Degree, Undergraduate, Postgraduate and Open) to exhibit their engineering projects in presentations and booths. Two HKU engineering projects were awarded in Postgraduate and Undergraduate sections respectively.

Gianni Heung, MSc student of the Department of Electrical and Electronic Engineering, crowned champion in the Postgraduate Section with “Project SunbYte – Sheffield University Nova Balloon Telescope”. SunbYte is a student-led project with 20 Engineering and astrophysics students across the UK. It aims to design a low budget telescope and focusing system that replaces the current rocket-based technology and to revolutionise solar observation by delivering low-cost high quality images of the sun.

Another award-winning project “Find A Seat App” was developed by two BEng(CompSc) students Olivia Lai Cheuk-wing (right) and Wong Sun-day (left). Through using Computer Vision techniques and Internet of Things (IoT) device, the app can detect real-time seat occupancies in HKU Main Library. The project was awarded a 2nd runner-up in the Undergraduate section of the competition.

Winner of Student Project Competition by HKIE MI Division

Among the nine projects nominated by the tertiary in the HKIE MI Division’s Student Project Competition, Anson Ho Chun-chi (BEng(ELM)) won the Champion with his project “Digital Twin for Industrial Robot Applications”, while another student from the Department of Industrial and Manufacturing Systems Engineering Fernaldy Soegianto got an Outstanding Award with his project entitled “An Efficient and Effective Heuristic for Allocating Airport Stands”.

(From left) Dr H.H. Cheung, Anson Ho and Fernaldy Soegianto.
**First runner-up at DreamCatchers MedTech Hackathon HK 2019**

Edward Lui Wui-wang, BEng(CompSc) final year student, won a first runner-up at the DreamCatchers MedTech Hackathon HK 2019 with his team “Alluminate” which was comprised of students from Stanford University, CUHK, HKUST and HKU Medicine. The project was an idea on preventing photo-epileptic seizures by detecting harmful light frequencies with computer vision, and blocking them out with electrochromic glasses.

**Li Ka Shing Prize Recipient**

Dr You Changsheng, a recent graduate of the Department of Electrical and Electronic Engineering, was awarded the prestigious Li Ka Shing Prize for his PhD research at HKU. His thesis research, under the supervision of Dr Kaibin Huang, lie at the frontiers of communication and computing. It makes pioneering contributions to the emerging area for 5G and beyond. The relevant publications have attracted more than 1,000 citations and many of them are on the popular-read lists of various IEEE databases. Dr You had filed a USA patent for his research and agreed to transfer the technology to LG Electronics, a world-leading telecommunication company, for commercialisation.

**Excellent Oral Presentation Award at the world’s biggest national biomaterials meeting**

He Shan, a PhD student of the HKU-SUSTech Joint PhD Programme, won an Excellent Oral Presentation Award at the 2019 Chinese Biomaterials Congress & International Symposium on Advanced Biomaterials in Dalian, China. She is co-supervised by Professor Min Wang of HKU Department of Mechanical Engineering and Professor Fuqen Ren of SUSTech’s Department of Materials Science and Engineering.

The 2019 Chinese Biomaterials Congress was held from August 22-25 in Dalian, China. It was organised by the Chinese Society for Biomaterials and hosted by the Affiliated Zhongshan Hospital of Dalian University. This biennial Congress is the biggest national biomaterials meeting in the world. This year, over 4,000 attendees and researchers from seven countries joined the congress and international symposium. More than 10 of them were members of the national academies in UK and US.
### Student Paper Competition Honorable Mention Award at 2019 International ACES Symposium

Yao Heming, PhD student of Dr. Lijun Jiang of the Department of Electrical and Electronic Engineering, received the Student Paper Competition Honorable Mention Award at the 2019 International Applied Computational Electromagnetics Society Symposium – China (ACES) in Nanjing, China in August, 2019. His award-winning paper “Machine Learning Methodology Review for Computational Electromagnetics” was co-authored with Dr. Jiang, Dr. H.H. Zhang and Dr. W. Sha.

The International Applied Computational Electromagnetics Society Symposium serves as a forum for developers, analysts, and users of computational techniques applied to electromagnetic field problems for all frequency ranges. The symposium includes technical invited plenary and regular presentations, software tutorials, vendor booths, and short courses.

### Silver Medals at finals of International Collegiate Programming Contest 2019

A HKU team coached by Mr. Sun Bintao of the Department of Computer Science won two Silver Medals at the Asia Shanghai Regional and the Asia East Continent Final of the International Collegiate Programming Contest (ICPC) in 2019. Team members included Dong Binrui (BEng(CompSc)), Kwok Kin-hei (BEng(CompSc)) and Lee Chun-yin (BSc(ActuarSc)).

The International Collegiate Programming Contest is an algorithmic programming contest for college students. Teams of three, representing their university, work to solve the most real-world problems, fostering collaboration, creativity, innovation, and the ability to perform under pressure. The HKU team competed with over 300 teams in the contests respectively.

### Third Prize and Outstanding Aesthetic Design Award at RoboMaster 2019 International Regional Competition

HKU RoboMaster team, HerKules, with membership of over 30 students from different Engineering disciplines, received a third prize (ranked from 9 to 17 among 173 teams) and the Outstanding Aesthetic Design Award at the RoboMaster 2019 International Regional Competition held in Shenzhen. In addition, Mr. Andy Kong, the Experiential Officer and a current PhD candidate in Computer Science Department, received the Outstanding Advisor Award.

This team was supervised by Dr. Kenneth K.Y. Wong of the Department of Computer Science and is supported by the Tam Wing Fan Innovation Wing.
Eames Zhang (right), MSc(Eng) in Transportation Engineering, received the award in the Master Degree category of the CILTHK Scholarship 2018/19. In addition, Jenny Kornubrabhan (BEng(ELM)) won the CILTHK Student Final Year Project Award 2019 with her thesis entitled “A Smart Integrated Solution for Future Retail Store”.

The Chartered Institute of Logistics and Transport in Hong Kong (CILTHK) is the professional body for those engaged in various sectors of transport and logistics, including air, sea and land, for both passengers and freight transportation.

Sharif Mohammed Nawaj (left), a recent graduate of BEng(EE), won the Silver Award in HKEIA Innovation & Technology Project Competition Award 2019 with his final year project entitled “Design and Implementation of a practical, compact and low-cost wireless power transfer system”. The project was supervised by Professor S.C. Tan of the Department of Electrical and Electronic Engineering.

A team comprised of Kwok Tsz-kin (BEng(ELM)), Maisie Kwok Tsz-Ling (BEng(ELM)), Choy Ying-wai (BEng(CE)), and Tsou Ngai-yan (BEng(CompSc)) won first runner-up at the Young Engineers Programme 2018/19 of the HKIE MI Division. Teams were required to identify operational problems during the factory visit and made proposal to tackle the problems for enhancing operational efficiency at an affordable cost. The programme was supported by ASM Pacific Technology Group.
Innovators Under 35 by MIT Technology Review for the Asia Pacific Region

Three researchers at the Faculty of Engineering are among the 20 Innovators Under 35 selected for the Asia Pacific Region by MIT Technology Review, a prestigious global news media on important new technologies under the Massachusetts Institute of Technology.

The 2020 list of regional awardees was announced on December 3, 2020. These outstanding young innovators will be joining the list of Under 35 honourees including Facebook’s Mark Zuckerberg, Google’s Sergey Brin and Larry Page since the award was launched in 1999 by MIT Technology Review.

The 2020 regional awardees were selected from a pool of 200 exceptional candidates. They are considered to be trailblazers in their fields and leaders of the next generation of technological breakthroughs. Their work includes applications in agriculture, artificial intelligence, biomedicine, construction, energy, new materials, robotics, and water.

Of the 20 awardees, 10 are from Singapore, four from Hong Kong, two from Australia and the rest from Indonesia, Malaysia, New Zealand and Taiwan. They will be honoured at the EmTech Asia conference held in February 2020 in Singapore.

The three HKU Innovators Under 35 are:

**Dr Hao Guo, Department of Civil Engineering**

Dr Guo’s research mainly focuses on fundamental mechanism investigation and novel materials development in advanced membrane-based water treatment and seawater desalination for sustainable water production. Targeting disaster relief and less developed regions, Dr Guo and his team invented an electricity- and chemical-free membrane filter for rapid water purification under the funding support of the Innovation and Technology Fund from the Hong Kong Government’s Innovation and Technology Commission. This invention won a Gold Medal at the 47th International Exhibition of Inventions Geneva. The technique has been successfully licensed to a Hong Kong-based company for further commercialisation.

**Dr Ziyan Guo, Department of Mechanical Engineering**

Dr Guo’s research focuses on innovating robotic devices for interventions requiring magnetic resonance imaging (MRI) guidance, e.g. stereotactic neurosurgery, and cardiac catheterisation. She developed a world-first intra-operative Magnetic Resonance Imaging (MRI)-guided neurosurgical robot with her team which is capable of navigating bilateral stereotactic tools through both left and right burr holes.

**Dr Ping Luo, Assistant Professor, Department of Computer Science**

Dr Luo’s research focuses on developing Computer Vision (CV) and AI technologies to understand human behaviors such as faces, emotions, actions and social relationships, in order to advance human/AI paired systems that outperform their singular counterparts. His groundbreaking researches included delving deeply into understanding the foundations of deep learning including autonomous machine learning, normalisation, and optimisation of deep neural networks. He also contributes many popular benchmarks to facilitate AI and computer vision researches for both academia and industry such as CelebA and DeepFashion. CelebA is the most widely used image database for face image generation. DeepFashion is the largest image database for understanding fashion trend by analysing clothing images.

Dean Christopher Chao commented, “We are delighted to learn that among the four honourees, three of them are from HKU Engineering. This indeed represents a great encouragement to our young engineers who are being recognised globally. This is also the second consecutive year of our young academics being awarded. It gives strong impetus to the young scientists, not only to our university, but to Hong Kong as a whole. It will definitely motivate fellow scientists and engineers to have more innovative researches in the future.”

The peer-reviewed annual award was established by MIT Technology Review in 1999 to recognise outstanding young innovators under the age of 35. In 2010, regional versions of the award were introduced to cover areas including Latin America, Europe, China, India, the Middle East and Southeast Asia/Oceania.
First Class of Natural Science Award by the China Society for Rock Mechanics and Engineering

Professor Quentin Z.Q. Yue from the Department of Civil Engineering and his team received the first class award of the 10th Science and Technology Award from the China Society for Rock Mechanics and Engineering for the study of the “Digital Image Based Numerical Methods for Analysis and Prediction of Behaviors of Soils and Rocks with Actual Meso-inhomogeneity under Loading” in the category of Natural Science.

Geomechanics calculate and predict mechanical responses and behavior of rocks, soils and concretes from elastic deformation to plastic deformation and/or brittle fracture. It plays a key role in geotechnical engineering and geohazard prevention. Following continuum mechanics, geomechanics have progressed greatly in the constitutive relations and numerical calculation methods. However, almost all the progresses were based on the fundamental assumption that the physical and mechanical properties of geomaterials are spatially homogeneous or piece-wiseely inhomogeneous. They could not take the actual meso-heterogeneity into the calculations and predictions.

Professor Yue and his team members from the University of Hong Kong and Institute of Rock and Soil Mechanics of Chinese Academy of Sciences have started this research since 1992. They used modern digital image technology and developed a numerical method for calculating and analysing the mechanical behavior of the real geomaterials by using actual meso-heterogeneity. This method realised the precise measurement and digital representation of spatially distributed meso-heterogeneity in real geomaterials, and the calculation of the deformation and failure process of the meso-heterogeneous geomaterials under loadings. The project pioneered the numerical modelling of actual geomaterials and led the progress and development of relevant fields internationally.

“As the only awardee for the First Class of Natural Science Award by the China Society for Rock Mechanics and Engineering in 2019, we have gone through a stringent evaluation process which included written recommendations from five peer experts, independent assessment of other peer reviewers, and face-to-face examination by an evaluation committee comprising 15 authoritative experts in the field of rock mechanics and engineering in China. The award is indeed extremely precious! It is a very important recognition of our research work at HKU’s Faculty of Engineering by the top professional body of rock mechanics and engineering in China. We are delighted and encouraged by the recognition and we will definitely dedicate our effort to make more contributions in the future. ” said Professor Yue.

Third Prize of WU WENJUN Artificial Intelligence Science and Technology Award

Dr Wong Ngai of the Department of Electrical and Electronic Engineering was awarded a Third Prize in the 2019 nationwide “WU WENJUN Artificial Intelligent Science and Technology Award” with a team project “Development of key technologies for AI edge computing and deep learning chips”. The project was conducted in collaboration with Professor Yu Hao of Southern University of Science and Technology, Professor Zhou Jun of University of Electronic Science and Technology of China and Professor Chen Haibo of Shanghai Jiao Tong University. The project provides a turnkey solution for low-power high-throughput edge artificial intelligence (AI) computing platforms. It is especially suitable for applications like autonomous driving and robotics in the modern era.

WU WENJUN Artificial Intelligent Science and Technology Award was initiated in 2008 and is currently organised by the Chinese Association for Artificial Intelligence. It is known as China’s highest award in smart science and technology with aims to recognise those who made outstanding contribution in artificial intelligent field; to mobilize the enthusiasm and creativity of the vast number of intelligent scientific and to promote the development of intelligent science and technology.
Research recognised by the State Council of the PRC

Congratulations to Professor James Lam of the Department of Mechanical Engineering for receiving State Natural Science Award (Second-class) for a project “Robust Control Theory and Methodologies for Time-delay Systems”.

The project has provided systematic methods for studying time-delay systems and their synthesis problems. The focuses are on reducing the conservatism of the stability criteria and the effects of time delays in the synthesis methods for time-delay systems. The mechanism of introducing slack variables to reduce the conservatism of stability criteria has been revealed and the equivalence of several representative stability analysis methods has been established. The achievements are the result of the long-term collaboration between the mainland team at Nanjing University of Science & Technology and Professor Lam.

The State Natural Science Award (SNSA) is China’s most prestigious award in the field of natural science. Organised by the State Council of the People’s Republic of China, the SNSA aims to recognise academic excellence in basic and applied research in natural science.

In addition, Professor Lam was also awarded the Second-class Natural Science Award by Chinese Association of Automation (CAA) in 2019 for a project entitled “Control Theory and Applications of Positive Systems”. The CAA Natural Science Award is given to teams or individuals who “clarify natural phenomena, characteristics, laws and methods and make major scientific discoveries in the field of basic research of automation in China.”

Furthermore, Professor Lam won the IET Journal Outstanding Editor-in-Chief Award under the category of “Control Theory & Applications”. The Institution of Engineering and Technology (IET) introduced this annual IET Journal Outstanding Editor Awards in 2019 to recognise a number of Editors and Editorial Board Members for particularly outstanding activities to maintain and further develop the high international standards and reputation of the IET’s Research Journals. Professor Lam was among the five recipients of Editor-in-Chief Awards 2019.

Fellow of the International Federation of Automatic Control

Professor David J. Hill of the Department of Electrical and Electronic Engineering was elected as a Fellow of the International Federation of Automatic Control (IFAC) for his contributions to stability theory and distributed control theory with applications to power systems.

The IFAC Fellow Award is given to persons who have made outstanding and extraordinary contributions in the field of interest of IFAC, in the role as an Engineer/Scientist, Technical Leader, or Educator. The first Fellows were elected at the IFAC World Congress in Prague in July 2005.

2019 Asia-Pacific Outstanding Paper Award of IEEE Communication Society

Dr Kaibin Huang of the Department of Electrical and Electronic Engineering and his former PhD student Dr You Changsheng received 2019 Asia-Pacific Outstanding Paper Award by IEEE Communication Society for a paper “Energy-Efficient Resource Allocation for Mobile-Edge Computation Offloading”. The paper made pioneer contribution to the areas of radio resource management for mobile edge computing. It has received more than 400 citations and it appears on the popular read-lists of various IEEE database.
Elected Fellow of the Hong Kong Academy of Engineering Sciences

Professor Christopher Chao, Dean of Engineering, has been elected Fellow of the Hong Kong Academy of Engineering Sciences. Professor Chao is among the two newly elected fellows of this year.

The Hong Kong Academy of Engineering Sciences was founded in 1994 by eight distinguished engineers in Hong Kong under the leadership of the late Hon. Sir S.Y. Chung, GBM, FEng, JP. It is an organisation of Hong Kong’s most eminent engineers of various disciplines who are recognized leaders of the profession with distinguished achievements in engineering sciences or applications.

Fellow of Advance HE

Dr Vincent Tam and Dr Joe Yuen of the Department of Electrical and Electronic Engineering were awarded the fellowship of the Advance HE. The fellowship demonstrates a personal and institutional commitment to professionalism in learning and teaching in higher education.

Advance HE, previously the Higher Education Academy, is an independent non-profit organisation committed to world-class teaching in higher education. It works in partnership with institutions and individuals in higher education in supporting student success.

Faculty Awards

Faculty Outstanding Teaching Award 2018-19

Individual:
Dr H.H. Cheung of Department of Industrial and Manufacturing Systems Engineering.

Team:
Dr K.S. Lui and her team (Professor Edmund Lam, Dr Vincent Tam and Dr Joe Yuen) of Department of Electrical and Electronic Engineering.

Faculty Knowledge Exchange Award 2019

“Modular Integrated Construction (MiC) for Buildings of Higher Quality, Productivity and Sustainability in Hong Kong” by Dr Pan Wei of the Department of Civil Engineering.
Alumnus Tony Shum to establish Education Fund benefitting Civil Engineering students

Ir Tony Shum, a 1977 graduate, recently donated HK$10M to The University of Hong Kong to establish the Tony Shum Education Fund. The Fund aims to support the education and development of students in the Department of Civil Engineering. It will provide resources to enhance the teaching facilities of the Department, with the objectives of supporting the improvement of laboratory equipment, computers and software, and the renovation of laboratories and studios. The Fund will also provide support for students of the Department, enabling them to participate in experiential learning activities locally, on the Mainland and overseas, as well as in international competitions. The Fund will also offer financial support to students with financial needs.

Ir Shum said, “I am humbled and blessed to have an Education Fund established at my alma mater. I hope that the students who benefit from this will eventually make their mark in the engineering and construction industry and continue to promote the Civil Engineering excellence of HKU. I deeply believe ‘It is more blessed to give than to receive’.”

Professor Christopher Chao, Dean of Engineering, expressed his gratitude to Ir Shum for his generosity: “The Faculty is greatly honoured and grateful for the generous support of Ir Tony Shum. The donation is meaningful to us as it illustrates the strong and enduring bonds between alumni and the Faculty.”

Professor Francis Au, Head of Department of Civil Engineering, said: “Ir Shum is our alumnus and has maintained a strong link with his alma mater over the years. The Fund is all the more notable as it is a personal commitment from Ir Shum to help his

Ir Tony Shum is the Founding Chairman of the Engineering & Construction Evangelical Fellowship in Hong Kong.

The Shums family shared the joy with Professor Xiang Zhang at the donation ceremony.

"brother and sister" engineers. We look forward to working closely with Ir Shum to ensure that the donation is put into good use to support our students, our teaching and our development in the coming years."

Ir Tony Shum graduated from HKU’s Department of Civil Engineering with a Bachelor of Science in Civil Engineering degree in 1977. Before his retirement in early 2016, Ir Shum was Chairman of Asia Pacific at AECOM, a renowned global engineering and construction firm. He was Managing Director of the Maunsell Group in Asia when Maunsell merged with AECOM in 2000. He is now a non-executive board director of Global Infrastructure Solutions, a leading construction and management services company in North America. Ir Shum is also the Founding Chairman of the Engineering & Construction Evangelical Fellowship in Hong Kong.
Establishment of HKUEAA Ir Dr Joseph Chow Ming Kuen Memorial Learning Fund

H.K.U. Engineering Alumni Association (HKU.E.A.A.) and H.K.U. Engineering Alumni Association Education Foundation (HKUEAA Education Foundation) donated over HK$2.6M to the Faculty of Engineering to establish the "HKUEAA Ir Dr Joseph Chow Ming Kuen Memorial Learning Fund" (Learning Fund) to support local and overseas student experiential learning activities. A cheque presentation ceremony was held at the 44th HKU.E.A.A. Annual Dinner on January 11, 2020. The President of HKU.E.A.A., Ir Raymond W.M. Choi and Mrs Selina Chow presented the cheque to Professor Xiang Zhang, President and Vice-Chancellor of the University of Hong Kong. The establishment of the Learning Fund will not only enrich the students’ learning experience throughout their journey at the Faculty, but also further broaden the horizon and enhance the all-round competencies of the students.

Ir Dr Joseph Chow Ming Kuen graduated from Engineering in 1964. When he was a student, he was elected Chairman of the HKU Engineering Society and organised its Golden Anniversary Celebrations in 1962 – a role he would reprise when the Faculty celebrated its Centenary Celebrations in 2012. He was the Founding President of the HKU.E.A.A. and a founding member of H.K.U.E.A.A. Education Foundation, nurturing young professionals and fostering the promotion of education of engineering. He was conferred the Honorary University Fellowship in 2013. For his contributions to the profession and the community, he was appointed a Justice of the Peace in 1992 and awarded an OBE in 1997. Ir Dr Chow has always been the staunch supporter of the Faculty and contributed his expertise and experience for the advancement of the University and the Faculty passionately. He is always willing to share his experience with the students in the hope that the engineering legacy can be passed on to the young generation.
A homecoming visit by the first batch of Electrical Engineering graduates

The Department of Electrical and Electronic Engineering welcomed their first batch of Electrical Engineering graduates for a homecoming visit in August. Accompanied by alumni representatives Mr. W.K. Lee and Dr. F.K. Lam, Professor S.K. Tso, Professor Joshua Wong and Mr. Anthony O visited the Department and met with Professor K.T. Chau, Head of the Department.

The first degree in engineering was called Bachelor of Science in Engineering (BSc(Eng)). It was awarded from the establishment of the Faculty until 1988. Since 1989, the degree had renamed as Bachelor of Engineering (BEng). Professor S.K. Tso, Professor Joshua Wong and Mr. Anthony O were among the first batch of five students who were conferred a degree of BSc(Eng) under the discipline of Electrical Engineering in 1961. It was indeed a precious opportunity to have them revisiting their alma mater after nearly 60 years from graduation.

HKUEAA in support of student experiential learning activities

H.K.U. Engineering Alumni Association (H.K.U.E.A.A.) Reception cum Advisor and Class Representative Appointment Ceremony was held on October 30, 2019. At the ceremony, HKUEAA presented a donation cheque of HK$200,000, being the last installment of the three-year donation pledge, in support of experiential learning activities in the Faculty of Engineering.

Professor Christopher Chao, Dean of Engineering, updated the alumni the recent achievements and research endeavours of the Faculty. Professor Chao thanked HKUEAA for their generous support to the engineering students. It is hoped that we can join hands to create opportunities for the best academic talents to excel and advance human knowledge to the benefit of society.

Dr. C.K. Chui, Director of Tam Wing Fan Innovation Wing, also presented to the alumni about the recent student projects and their achievements which were supported by the HKUEAA Experiential Learning Fund.
Programmes offered by HKU Engineering

Undergraduate Programmes
- Bachelor of Engineering in Civil Engineering
- Bachelor of Engineering in Computer Science
- Bachelor of Engineering in Electrical Engineering
- Bachelor of Engineering in Electronic Engineering
- Bachelor of Engineering in Industrial Engineering and Logistics Management
- Bachelor of Engineering in Mechanical Engineering
- Bachelor of Engineering in Biomedical Engineering
- Bachelor of Engineering in Engineering Science
- Bachelor of Arts and Sciences in Financial Technology
- Double Degrees in BEng/ BEng(BME) + BBA

Research Postgraduate Programmes
- Doctor of Philosophy (PhD)
- Master of Philosophy (MPhil)

Taught Postgraduate Programmes
- Master of Science in Engineering in Building Services Engineering
- Master of Science in Engineering in Electrical and Electronic Engineering
- Master of Science in Engineering in Energy Engineering
- Master of Science in Engineering in Environmental Engineering
- Master of Science in Engineering in Geotechnical Engineering
- Master of Science in Engineering in Industrial Engineering and Logistics Management
- Master of Science in Engineering in Infrastructure Project Management
- Master of Science in Engineering in Mechanical Engineering
- Master of Science in Engineering in Structural Engineering
- Master of Science in Engineering in Transportation Engineering
- Master of Science in Computer Science
- Master of Science in Electronic Commerce and Internet Computing
- Master of Science in Financial Technology and Data Analytics (Proposed implementation date: Fall 2021)

Alumni contact update form

Surname*  
Given Name*  
University No.  
Year of Graduation*  
Programme*  
Mobile  
Email  
Home Address  
Home Telephone  
Current Position  
Office Address  
Office Telephone

* Required field

Please submit this form by fax (852) 2546-9142, email: engfac@hku.hk or by post to the Faculty Office. You can access the form by scanning the QR code.

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Giving
The Faculty of Engineering, HKU will endeavor to innovate through world-class education and cutting-edge research; to conduct interdisciplinary and international collaboration to overcome regional and global challenges, and to create impact on knowledge-based economy through technology development and entrepreneurship. Supporting HKU Engineering helps us to advance our mission of creating knowledge, nurturing young minds, and influencing the future society. We value your generous support which will contribute to our continuous effort in pursuing excellence in teaching and research. For more about Giving to HKU Engineering, please visit https://engg.hku.hk/Giving.