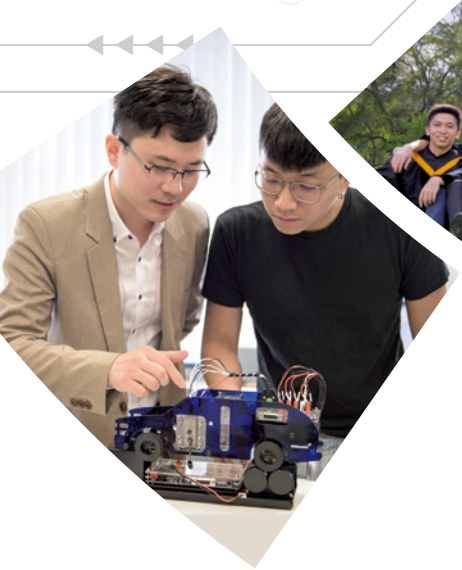
Department of

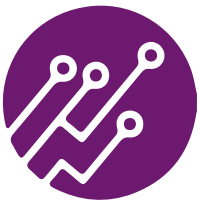
Mechanical and Automation Engineering

2019-2021 Report



FACTS AND FIGURES (2019-2021)

GRANTS IN TOTAL:
OVER HK$52 MILLION



NO. OF GRANTS:
63

NO. OF HONOURS AND AWARDS:
76

* NO. OF FACULTY MEMBERS:
26

NO. OF SCHOLARSHIPS:
191

SCHOLARSHIP TOTAL:
OVER HK$4 MILLION

NO. OF PUBLICATIONS:
OVER 500

* excluding Professors (by courtesy) and Adjunct Professors/Adjunct Assistant Professors

CONTENTS

MESSAGE FROM DEPARTMENT CHAIRMAN

In the midst of the social unrest in 2019 and the global upheaval due to COVID-19 pandemic, the Department of Mechanical and Automation Engineering (MAE) upholds its spirit to improvise, adapt to new norms and overcome unprecedented challenges. I am proud to state that, with perseverance and concerted efforts of all MAE members, the Department has outshone in both education and research amid the adversity.

The MAE Department aims at nurturing future technological leaders and talents, and strives to excel at conducting research in Mechanical and Automation Engineering, as well as Energy and Environmental Engineering (EEEN). The Department has grown over the years with a current total of 26 faculty members and over 100 undergraduates graduating from MAEG and EEEN Programmes in 2021. With the expertise of our world-class faculty members and strong international collaborations, the Department is consistently making significant advancement in research areas of Design and Manufacturing, Energy/Building/Environmental Technologies, Intelligent Systems, MEMS/Nano/Material Technologies, Robotics and Automation, Systems and Control.

Throughout the past two years, our faculty members, students and alumni have won prestigious awards and recognitions locally and worldwide, including Top 10 Winner of Falling Walls 2020 (Engineering and Technology), ASME 2020 Adaptive Structures and Material Systems Award, First Prize at the International Bionic Innovation Competition 2019, Winner of 2019 UGC Teaching Award, 2021 SME Geoff Boothroyd Outstanding Young Manufacturing Engineer Award, Champions in Robocon 2019 and 2021 Hong Kong Contest, Asia-Pacific Robot Contest 2019 – Mongolia, Gold Medals in International Exhibition of Inventions Geneva 2021, First Prize in the Hong Kong University Student Innovation and Entrepreneurship Competition, to list just a few.

Among many achievements, it is worth noting that in the Research Assessment Exercise (RAE) 2020, 100% of our impact cases achieved the highest rating 4*, meaning "outstanding impacts in terms of their reach and significance". What's more, the overall quality in mechanical and production engineering of CUHK is the highest, up to 94%, among all universities in Hong Kong by adding both categories of 4* (world leading) and 3* (internationally excellent). In addition, our faculty members take part in three Inno Centres, namely Hong Kong Centre for Logistics Robotics (HKCLR), Multi-Scale Medical Robotics Center (MRC), and Centre for Perceptual and Interactive Intelligence (CPII), which are funded by Innovation and Technology Commission (ITC) under the InnoHK programme initiated by HKSAR Government to develop Hong Kong as the hub for global research collaboration. Two MAE faculty members are serving as Director of HKCLR and Co-Director of MRC, respectively.

I am pleased to say that the MAE Department is now in a very strong position with our strengths echoing well with the key areas addressed in the University's Strategic Plan 2021-2025 (CUHK 2025), including Research and Innovation, Student Experience, Alumni Engagement, Talent Attraction, and Global Engagement. I would also like to take this opportunity to express my sincerest gratitude to all faculty members and staff for taking the Department to new heights over the years. It is my strong belief that our Department will continue to flourish in the years to come with all MAE members working together, turning opportunities into successes!

Professor LIAO Wei-Hsin
Department Chairman
Choh-Ming Li Professor of Mechanical and Automation Engineering

MESSAGE FROM EEEN PROGRAMME DIRECTOR

Sustainability implies living well within the ecological limits of the earth. Affordable and clean energy, climate action, and good health and well-being are among the 17 Sustainable Development Goals proposed by the United Nations (UN). In the past year, the outbreak of the COVID-19 pandemic has posed grand challenges in almost every aspect for the whole world. Sustainable development becomes even more important in such a difficult time. The Energy and Environmental Engineering (EEEN) Programme at CUHK is designed for engineering-minded students with aspiration to help make the world greener and sustainable for future generations.

The engineers nowadays need to find holistic and effective solutions to protect our fragile planet and meet the needs of a growing human population. The EEEN Programme puts forward an interdisciplinary perspective for learning and understanding the relations and trade-offs between energy and environment, and the ensuing engineering challenges in attaining viable solutions. Students are trained in a set of courses ranging from energy principles, environmental studies, urban pollutions, to smart building design and control, as well as energy assessment and management. We envision great career prospects for our graduates in utility companies, energy-related firms, green technology start-ups, government agencies, and building design and service sectors.

Faculty members in the EEEN Programme conduct cutting-edge research in the broad fields of energy conversion and storage, green building and indoor air quality, combustion and gas sensors, and smart grid. Prof. LU Yi-Chun and her research team achieved the breakthrough in the development of a novel charge-reinforced ion-selective membrane for sulphur-based redox flow batteries, which took a significant step forward in the practical application and commercialisation of redox flow batteries in grid-scale storage for renewable energy. Prof. CHEN Chun's group is working on novel environmental control systems for commercial airplanes to reduce the person-to-person airborne infectious disease transmission in the cabins, which is especially meaningful in the context of the current COVID-19 pandemic.

We are most excited about the future prospects of the EEEN Programme as an emerging and vibrant field of study. The importance of its subject matters will only grow in time. We welcome our readers to find out more about this relevant and exciting programme in the following report.

Professor XU Dongyan
Director
Energy and Environmental Engineering Programme

FACULTY MEMBERS' RESEARCH PROJECTS

Prof. AU Kwok Wai Samuel

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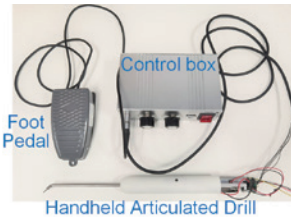
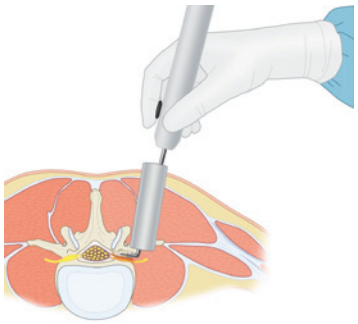
Associate Professor

Miniaturized Steerable Surgical Drill for Confined-Space Bone Work

The goal of this project is to develop a miniaturized steerable surgical drill for bone work in confined space. The miniaturized dimension (Φ4.5 mm) and largely enhanced distal steerability (±65 degrees) enable surgeons to access target sites through small incisions while steering around anatomical corners. Unlike existing works using flexible continuum mechanisms, we use articulated joints and non-flexible torque transmission mechanisms to simultaneously obtain high stiffness and strength, large articulation angle, and nearly zero bend radius. We integrate the proposed articulated drill tip into a lightweight (200 g) pen-style handheld device, which is easy to use and integrate into existing surgical procedures. Besides, 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.





Research Interests:

- Medical Technology

Prof. CHEN Benmei

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Professor

Intelligent Navigation and Robust Flight Control Systems for Unmanned Systems

In this research project, we propose to study and investigate a robust and sophisticated flight control system framework with intelligent motion planning techniques using Model Predictive Control (MPC) and a Robust and Perfect Tracking (RPT) control method for unmanned aerial vehicles. The MPC-based motion planning is incorporated with an appropriate neural network and a derivative-free optimization to generate optimal paths and trajectory references for the Unmanned Aerial Vehicle (UAVs). This allows the UAV to be operated in real and complex environments. The RPT control is used to perfectly and robustly track the resulting reference, and yield good flight performance.

Research Interests:

- Unmanned Systems Technologies
- Control Theory and Applications

Prof. CHEN Chun

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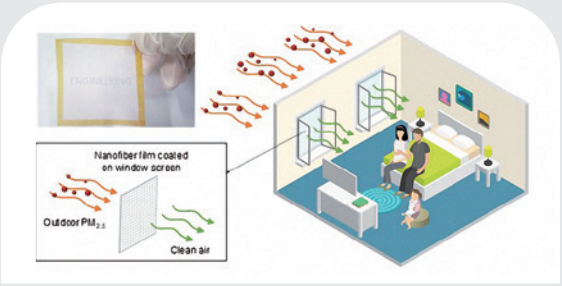
Assistant Professor

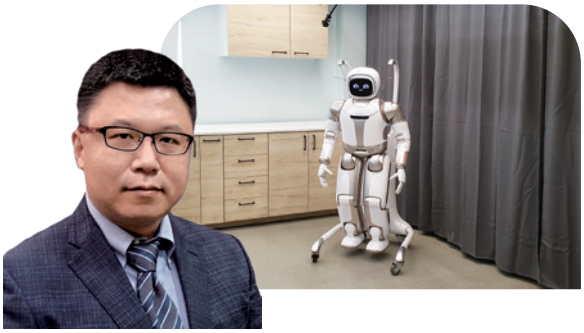
Novel Nanofiber Filters for Indoor Particle Removal

Currently, High Efficiency Particulate Air (HEPA) filters are widely used in the Heating, Ventilation, and Air-Conditioning (HVAC) systems to remove indoor $PM_{2.5}$. However, these HEPA filters usually lead to a large pressure drop, which increase the energy consumption in certain HVAC systems. Nanofiber air filters fabricated using the electrospinning technique can achieve high particle removal efficiency with a relatively low pressure drop because of the slip effect. They may therefore be applied in buildings to reduce indoor exposure to $PM_{2.5}$ with lower energy consumption. Our group has developed several novel air filters such as silk fibroin/polyvinyl alcohol and metal-organic frameworks-based nanofiber filters. These thin, flexible, and light-weight nanofiber filters can achieve over 95% $PM_{2.5}$ removal efficiency with lower pressure drop compared with traditional HEPA filters. Furthermore, we developed a method for modelling the particle removal efficiency and pressure drop across electrospun nanofiber air filters using the filter parameters, i.e. fiber diameter, filter thickness, and packing density. The proposed models can be used for structure optimization to enhance the performance of the electrospun nanofiber filters.



Research Interests:

- Indoor Air Quality
- Aerosol Dynamics
- Aircraft Cabin Environment
- Airborne Infectious Disease Transmission



Prof. CHEN Fei

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Assistant Professor

Robot Learning and Control with Human-in-the-Loop

The lab focuses on the co-evolution of robotics and artificial intelligence technologies to drive breakthrough research enabling robots to perform complex tasks to assist human beings in real world. The concept is to teach robots to learn new skills by perceiving the environments while interacting with and learning the demonstration from humans. Learning manipulation skills with the disentangled latent manipulation space, based on the created large human manipulation motion and perception datasets, allows unifying various robot controllers. The technologies will be applied on various available robots in the lab, such as Walker humanoid, CURI mobile manipulators and extended to other shapes of manipulation, such as robot bimanual manipulation, wheeled mobile manipulation, Hybrid Loco-Manipulation, human and robot co-manipulation. The target application areas include flexible manufacturing, logistics, healthcare, agri-food, etc.

Research Interests:

- Mobile Manipulation Robot
- Robot Grasping and Manipulation
- Robot Perception and Learning

Prof. CHEN Shih-Chi

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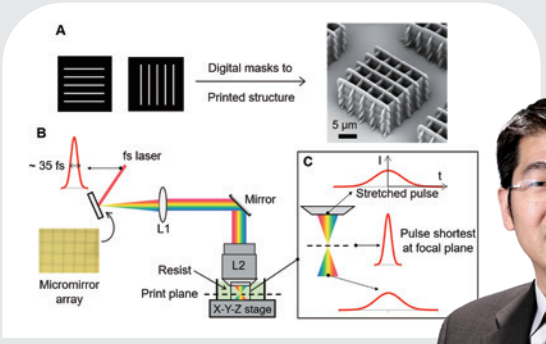
Professor



Multiscale Precision Instrumentation Laboratory

Prof. CHEN Shih-Chi's research group focuses on generating the scientific knowledge required to design novel precision and optical instrumentations at various length scales for measuring, manipulating, visualizing, and manufacturing things at micrometer and nanometer scales. His team uses the principles of mechanical design, precision engineering, optics, chemistry, biology and manufacturing – in combination with invention – to create new models, tools, machines, and fabrications processes that accelerate discoveries in medicine and science. The image presents the design and results of femtosecond projection two-photon lithography, a new 3D printing system developed by Prof. CHEN's team that set new world records on printing resolution (140 nm), rate (100 mm3/hr) and cost (US$ 1/mm3), generating significant impact in the nanotechnology community.

Research Interests:

- Ultrafast Laser Applications
- Biomedical Optics
- Precision Engineering
- Nanomanufacturing

Prof. CHEN Yue

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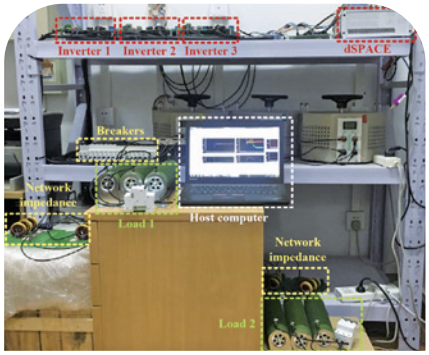
Assistant Professor

Energy Sharing: New Opportunity for Accelerating a Low-Carbon Future

The proliferation of distributed energy resources reinforces the need for innovative mechanisms to coordinate the end-users to maximize their flexibility. Inspired by the sharing economy in other sectors, we explored the potential of energy sharing. Several effective energy sharing mechanisms for different application scenarios were designed. Their superiorities over centralized and self-sufficiency schemes were revealed by theory and experiments. Prof. CHEN Yue was invited to give talks at 2020 INFORMS, 2020 EECS Rising Stars Workshop, 2021 IEEE PES General Meeting, etc. on the research outcomes published in top-tier journals. She is also organizing an 2021 INFORMS session *"Sharing Economy in Energy Networks"* and an IET Renewable Power Generation Special Issue *"Low-carbon Operation and Marketing of the Distribution System"*.



Research Interests:

- Smart Grid
- Integrated Energy System
- Applied Optimization
- Game Theory
- Mathematical Economics

Prof. CHENG Shing Shin

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Assistant Professor

MRI-Guided Flexible Neurosurgical Robots

Intracranial lesions are difficult to access due to their locations deep in the brain and often close to critical neurovascular structures. Minimally invasive techniques, such as neuroendoscopy, does not offer sufficient distal dexterity and intra-operative visualization of the cross-sectional view of the lesions. In our research, we investigate the feasibility of employing flexible neurosurgical instrument under continuous Magnetic Resonance Imaging (MRI) to enable dexterous distal manipulation and clear visualization of the lesion position relative to its environment. We have focused our research on developing millimeter-scale flexible instrument, compact, modular actuation mechanism, sensors free of electromagnetic interference, and optimized control framework. Smart actuators, including shape memory alloy and piezoelectric materials, have been integrated with dexterous instrument design in our latest robotic system and are being evaluated for MRI compatibility.

Research Interests:

- Surgical Robotics
- Flexible Robots
- Image-Guided Navigation
- Artificial Intelligence in Control and Sensing

Dr. HAN Dongkun

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Lecturer

Robust Multi-Task Formation Control via Parametric Lyapunov-Like Barrier Functions

An essential problem in the coordination of multiple agents is formation control. Significant challenges to the theoretical design may arise when the multi-agent system is subject to uncertainty. This paper considers the robust multi-task formation control problem for multiple agents whose communication and measurements are disturbed by uncertain parameters. The control objectives include 1. achieving the desired configuration; 2. avoiding collisions; 3. preserving the connectivity of uncertain topology. To achieve these objectives, we first provide conditions in terms of Linear Matrix Inequalities (LMIs) for checking the connectivity of uncertain topologies. Then, we propose a new type of Lyapunov-like barrier functions, called parametric Lyapunov-like barrier functions, that is applicable to multi-agent systems with uncertainties in communication and measurements. It is shown that this new type of Lyapunov-like barrier functions guarantees the robust multi-task formation and displays advantages over parameter-independent Lyapunov-like barrier functions. The efficacy of the proposed method is demonstrated via simulation results.

Research Interests:

- Multi-Agent Systems
- Control Systems

Prof. HUANG Jie

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Choh-Ming Li Research Professor of Mechanical and Automation Engineering

Control and Automation

Multi-agent control systems arise from numerous engineering applications such as synchronized motion of multiple robots, formation flying of multiple flight vehicles, mobile sensor area coverage, control of power grids, etc. The cooperative control of multi-agent systems has been one of the central control problems since the early 2000s. The research started from the consensus problem for simple linear systems, and has now advanced to the stage of dealing with complex multi-agent systems characterized by one or more aspects of nonlinearity, uncertainty, heterogeneity, switching network topologies. A specific challenge to the control of a multi-agent system is that the control law has to satisfy switching communication constraints. Such a control law is called a distributed control law. We have been developing two approaches, namely, distributed observer approach and distributed internal model approach to handle the cooperative control of complex multi-agent systems.

Research Interests:

- Systems and Control
- Robotics and Automation
- Guidance and Control of Flight Vehicles
- Intelligent Control

Prof. Juan ROJAS

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Research Assistant Professor

Exploiting Equivariance for Sample-Efficient Deep Reinforcement Learning

Deep Reinforcement Learning (DRL) has achieved phenomenal progress and milestones in the last seven years. DRL is posed to lead the next cycle of evolution in Artificial Intelligence. Whilst DRL is inspired on psychological and neuroscientific perspectives, it's learning paradigm its sample complexity is staggeringly high. The amount of training required in many DRL policies is one of the main obstacles of adopting DRL in industrial and practical applications. This project aims at significantly reducing the sample complexity in DRL policies by leveraging principles from invariance and equivariance. Invariant and equivariant transformations are ideally suited to extend an agent (the robot(s)) experience with the world to other parts of the state-action space. In effect, we can from a single experience, help the robot to replicate that experience to many other locations and in so doing vastly accelerate the sample efficiency and efficacy of its learning. This work will explore how to best apply and learn such transformations to maximize a robot's efficacy. We will apply this to large-scale bin-picking environments that can be of immediate impact in logistics scenarios. We focus in being able to resolve particularly hard objects (small, irregularly shaped) and with a large variation across its properties. We expect to achieve state-of-the-art performance at a fraction of the sample cost.

Research Interests:

- Robot Decision Making
- Manipulation
- Introspection
- Recovery
- Interaction

Prof. LAU Darwin Tat Ming

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Associate Professor

Cable-Driven Robot System for the Cleaning of Sedimentation Settler Inclined Plates

Lamella plates of sewage sedimentation tanks increase the efficiency in separating the sludge and waste water. However, sludge would aggregate on the plates over time. Cleaning of the sludge is a laborious, harsh and dangerous job for human workers, due to its large tank size, working above waste water, and the unpleasant smell. Supported by the HKSAR Drainage Services Department, a robotic solution is developed to automate the cleaning of lamella plates. The system developed is a type of cable-driven parallel robot that is mounted above the sedimentation tank with two types of cleaning tools, and is designed to be robust and friendly for site workers to operate for daily operation. The robot was pilot tested at the Yuen Long Sewage Treatment Works.

Research Interests:

- Robotics
- Dynamics and Control
- Biomechatronics
- Building Construction and Maintenance Robots

Dr. LI Yiyang

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Senior Lecturer

Robust Damage Detection and Control: from Algorithm Optimization to Control System Design

Structural damage detection is a typical problem which has received much attention over the past decades. In engineering practice, the existence of uncertainties (parameter uncertainty and/or measurement error) will lead to a large discrepancy between theoretical results and real ones during damage identification, and consequently affect damage control strategies. Therefore, the robustness becomes one of the most important features of algorithm optimization and control system design. This project aims to develop a heuristic algorithm to solve multimodal optimization problems, and is applied for damage identification and control of large-scale structures with various damage scenarios. It is hoped that this study can provide some guidance on structural health monitoring, especially for extreme damage cases, e.g., adjacent damage, or near-boundary damage.

Research Interests:

- Structural Health Monitoring
- Noise and Vibration Control
- Algorithm Optimization
- Smart Structures

Prof. LIAO Wei-Hsin

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Choh-Ming Li Professor of Mechanical and Automation Engineering
Department Chairman
Director, Institute of Intelligent Design and Manufacturing

Vibration, Energy Harvesting, Human Motion

By utilizing adaptive features, smart materials can be built as actuators and sensors. They were used as intelligent elements for vibration control of structures. On the other hand, energy can be harvested from vibration and human motion. Piezoelectric and electromagnetic power generators were used to transform the mechanical energy from vibration and human motion into electrical energy. Since there is a large amount of kinetic energy in the human body during activities, capturing human motion and converting it into electricity is envisaged to render promising prospects for sustainably powering wearables and fulfilling the continuous working requirement of IoT applications. Besides, we have also developed robotic exoskeletons and smart ankle-foot prostheses that can assist people with impaired mobility. Prof. LIAO received *ASME 2020 Adaptive Structures and Material Systems Award* for his outstanding contributions to the field through research, education and technology transfer.

Research Interests:

- Smart Materials and Structures
- Energy Harvesting and Vibration Control
- 3D/4D Printing
- Mechatronics
- Exoskeleton and Prosthesis

Prof. LIU Yunhui

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Choh-Ming Li Professor of Mechanical and Automation Engineering
Director, CUHK T Stone Robotics Institute (CURI)
Director, Hong Kong Centre for Logistics Robotics

Image-Guided Automated Robotic Surgery

Robotics surgery is being widely used in various surgical procedures. Existing surgical robots operate under the mode of remote-control by surgeons. Under the support of the RGC Theme-Based Research Scheme, this project aims at automating surgical steps or supportive tasks of existing manual robotic surgery using advanced sensing, automatic control and artificial intelligence so as to reduce workload of surgeons and impacts of human factors on safety, quality, and consistency of surgical operations. The enabling technologies being developed include real-time sensing of surgical objects, image-guided surgical planning and navigation, automatic action control, surgical intelligence, and integration and clinical verification. We have also developed two robotic assistants that automatically manipulate endoscope and uterus in sinus surgery and the total laparoscopic hysterectomy, respectively. The performance of the robots has been examined by clinical trials at Prince of Wales Hospital. This project involves collaboration with Intuitive Surgical Inc., Imperial College London, and Johns Hopkins University.

Research Interests:

- Medical Robotics
- Logistics Robotics
- Construction Robotics
- Machine Vision
- Biomedical Engineering

Prof. LU Yi-Chun

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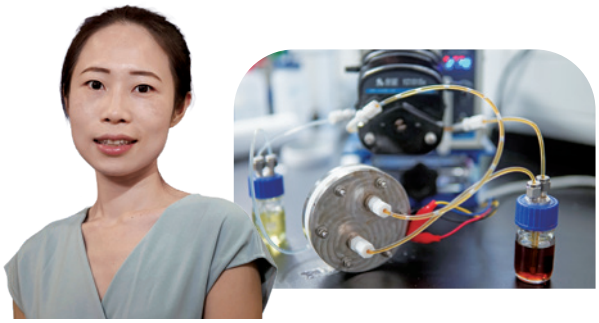
Associate Professor
MSc Programme Director



Safe and High-Energy-Density Aqueous Batteries

The widespread and deep penetration of renewable energy relies on low-cost and efficient energy storage technologies. Prof. LU Yi-Chun's research group has been working on the forefront of safe and clean energy storage with strong commercialization potentials. We have demonstrated a high-voltage aqueous battery using low-cost and eco-friendly molecular crowding electrolytes and low-cost and long-life polysulfide redox flow batteries. Owing to its inherent safe feature (water based) and high energy density, these results have strong potentials in commercialization.

Research Interests:

- Energy Storage and Utilization
- Batteries and Fuel Cells
- Redox Flow Batteries
- Energy Storage for Electric Vehicles and Micro-Grid

Prof. REN Wei

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Associate Professor

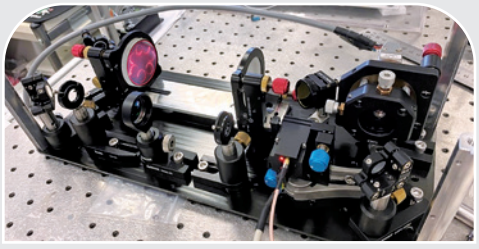
Ultrasensitive Optical Gas Sensing Technology

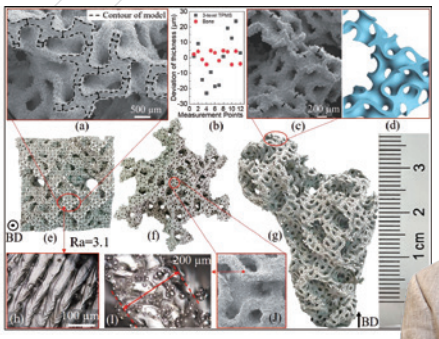
Our goal is to develop novel spectroscopic techniques for trace gas sensing, to innovate laser diagnostics for environmental monitoring and industrial process control, and to understand the fundamental processes in energy and biomedicine. We have innovated laser spectroscopic techniques with artificial intelligence to achieve ultrasensitive, ultra-dynamic-range and online gas detection. Our research to date has resulted in more than 80 peer-reviewed journal publications and 6 US and Chinese patents. Our techniques have allowed direct applications to exhaust monitoring in power plants, petrochemical industries, and patient breath analysis. These sensors are expected to further contribute to the next-generation sensing systems required for robotics and smart city.

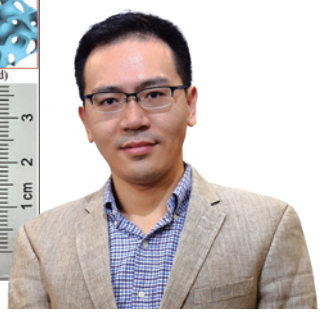
LaSense Technology, founded as a spin-off company from our laboratory, has won many prestigious awards including Gold Medal in 2021 International Exhibition of Inventions Geneva, Grand-Class Award in the 6th Hong Kong University Student Innovation and Entrepreneurship Competition, Gold Medal in the 12th Challenge Cup China University Student Entrepreneurship Plan Competition, and completed the Multi-Million Yuan Angel Round of Financing in 2021.

Research Interests:

- Optical Gas Sensor
- Environmental Monitoring
- Leakage Detection
- Biosensing







Prof. SONG Xu

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Assistant Professor

STL-Free Integrated Design and Manufacturing Approach for High-Precision 3D Printing

High-precision powder bed fusion (PBF), a type of 3D printing technology, together with highly complex geometries necessitate a much more scalable representation of the geometry and an efficient computational pipeline. This work showcases a new digital design and manufacturing paradigm to solve the scalability and efficiency challenges by using the concept of STL-free workflow. It seamlessly integrates implicit solid modelling for design and direct slicing for manufacturing without any intermediate steps related to STL meshes. This method allows us to create highly complex geometries filled with multiscale triply periodic minimal surfaces (TPMS), which cannot be efficiently handled by the conventional CAD software, and they are fabricated using an in-house PBF with feature resolution smaller than 60 μm, which is not yet attainable by the commercial PBF solutions.

Research Interests:

- Micro/Meso Manufacturing Processes
- Physically-Based Finite Element Simulation
- Design for Additive Manufacturing

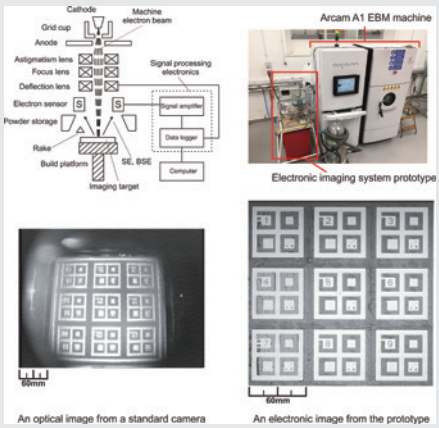
Prof. WONG Hay

haywong@cuhk.edu.hk
Assistant Professor

In-Situ Process Monitoring for Metal Additive Manufacturing

Reliability is key to any manufacturing system. In metal 3D printing, if we are to manufacture in a layer-wise manner, we should also perform rigorous quality control in a layer-wise manner.

Metal 3D printing is beginning to achieve production uptake in the medical devices and aerospace industries. Whilst increasing system throughput has been the recent focus in both academia and industry, the development of better process monitoring capability has stagnated.



The focus of Prof. WONG Hay's research group is to further mature the metal 3D printing process by observing and understanding how component defects and process anomalies are formed and evolved. The group's work on Electron Beam Additive Manufacturing process monitoring has earned them 2 international patents-pending and 2 IET Innovation Awards. The group believes that better quality control in 3D printing will benefit our society with a whole new range of certified, cost-effective and bespoke products and machine parts.

Research Interests:

- Additive Manufacturing
- In-Situ Process Monitoring
- Instrument Development
- Closed-Loop Feedback Control
- Smart Manufacturing

Prof. XU Dongyan

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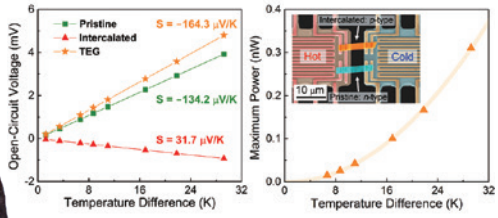
Associate Professor
EEEN Programme Director



Chemically Switchable Conduction in Bi_2Te_3 Nanoribbons for Thermoelectrics

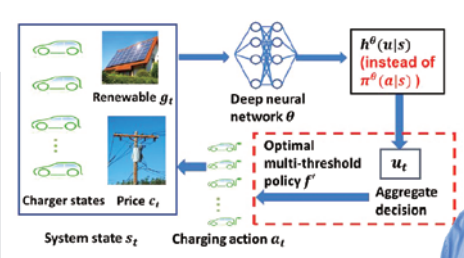
Realizing switchable *n*-type and *p*-type conduction in Bi_2Se_3, a traditional thermoelectric material and a topological insulator, is highly desirable for thermoelectrics, spintronics, and quantum computing. Switching between *n*-type and *p*-type conduction in single Bi_2Se_3 nanoribbons is achieved by a reversible copper (Cu) intercalation method. Density functional theory calculations reveal that such a switchable behaviour arises from the electronic band structure distortion caused by the high-concentration Cu intercalation and the Cu substitution for Bi sites in the host lattice. A nanoscale thermoelectric device was demonstrated with one pair of the pristine *n*-type and intercalated *p*-type Bi_2Se_3 nanoribbons, which is promising for on-chip thermoelectric applications.

Research Interests:

- Nanoscale Heat Transfer
- Thermoelectrics

Prof. XU Yunjian

yjxu@mae.cuhk.edu.hk
Assistant Professor



Optimal Control Enhanced Deep Learning and its Applications

Prof. XU Yunjian's research focuses on the development of new methodological approaches that reduce the dimensionality of deep neural network outputs (of deep reinforcement learning algorithms), through the establishment of optimal control policy characterizations. Prof. XU has applied the developed analytical and algorithmic results to a variety of engineering fields, including large-scale scheduling of electric vehicle charging under random electricity prices, job scheduling in mobile edge computing under random renewable generation, and the smart control of Heating, Ventilation and Air Conditioning (HVAC) systems for energy saving/comfort enhancement.

Research Interests:

- Stochastic Optimal Control
- Deep Reinforcement Learning
- Power System and Electricity Market

Prof. YAM Yeung

yyam@mae.cuhk.edu.hk
Research Professor
Director, CUHK Shenzhen Research Institute (SZRI)

Endoscopic Surgical Robotic System

The project is aimed at the development of enabling technologies for an enhanced endoscopic robotically-assisted platform comprising of two surgical tools going through the endoscopic channels to the surgical location for performing retraction, dissection, and tissue repair with suturing. Design and incorporation of new manipulators and tools with hybrid sensing and intelligent control capabilities will also be included. In this regard, the team is currently pursuing the construction of a novel dual channel 3D scanner endoscopic optical imaging system that can provide the needed 3D data to accurately capture surgical environment and be able to precisely locate surgical tools in relation to the surgical target.

Research Interests:

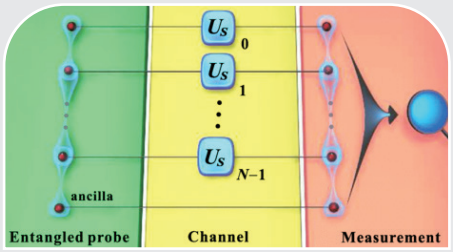
- Computational Control Design
- Intelligent Systems
- Human Skill Acquisition for Dexterous Manipulations
- Endoscopic-Based Surgical Robotics

Prof. YUAN Haidong

hdyuan@mae.cuhk.edu.hk
Associate Professor

Ultimate Precision Limit for Quantum Magnetometry

The precise measurement of a magnetic field is one of the most fundamental and important tasks in quantum metrology. Together with collaborators at USTC, Prof. YUAN Haidong's research group provided an approach to characterize the minimal tradeoff among the precisions of multiple parameters, which led to the identification of the ultimate precision limit for the estimation of all three components of a magnetic field under the parallel scheme. The obtained precision sets a benchmark on the precision of the multiparameter quantum magnetometry under the parallel scheme, which is of fundamental interest and importance in quantum metrology. The result has been published in Physical Review Letters, the leading physics journal, as Phys. Rev. Lett. 125, 020501 (2020) with the title *"Minimal Tradeoff and Ultimate Precision Limit of Multiparameter Quantum Magnetometry under the Parallel Scheme"*.



Research Interests:

- Quantum Control
- Quantum Computation
- Quantum Metrology
- Quantum Information Science

Prof. ZHANG Li

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Professor

Micro-/Nanorobotics for Translational Biomedicine

Prof. ZHANG Li's research group is a world-leading group in the research field of Micro-/Nanorobotics for biomedical applications, which exploits synergies between the science/engineering researchers and medical doctors from CUHK. His lab aims to address several fundamental key challenges in magnetic Micro-/Nanorobots: from individual to swarm, to develop the Micro-/Nanorobotic systems and platforms, and to realize their clinical translation with a focus on the digestive tract and the vascular system.

His latest collaborative research with CU Medicine colleagues was published in the prestigious robotics journal, *"Science Robotics"*, in which his team reported that microrobots can be delivered rapidly with real-time tracking and high precision to tiny and tortuous lumen deep inside the body in minutes, using clinical imaging modalities and magnetic navigation tools.

Research Interests:

- Microrobotics
- Nanorobotics
- Translational Biomedicine

Prof. ZHANG Weizhao

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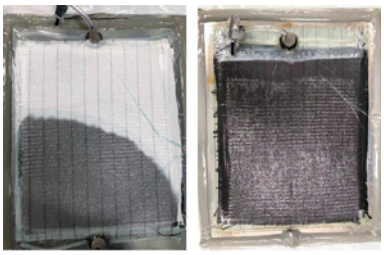
Assistant Professor

Development of Numerical Modelling Methods to Predict Process and Performance of Carbon Fibre Composites

Prof. ZHANG's latest research focuses on modelling of process and performance of carbon fibre composite parts, and optimization of composite part production using numerical simulation. Currently, there are three ongoing projects related to these topics, including (1) modelling of polymer resin solidification in preformed composites with non-uniform and non-orthogonal carbon fibre yarn angles, (2) characterization and modelling of performance degradation of carbon fibre composites for offshore wind turbines, and (3) modelling-based process and performance optimization for carbon fibre composite parts made by preforming. These research works aim to develop new tools based on state-of-the-art composite fabrication, characterization and numerical modelling techniques, so as to promote application of light-weight composites for energy saving and emission reduction.

Research Interests:

- Composite Materials
- Advanced Manufacturing
- Computational Mechanics



Partial resin infusion Full resin infusion

Material-level model for carbon fiber composites

Sideview

Prof. ZI Yunlong

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Assistant Professor

Water-Tube-Based Triboelectric Nanogenerator for Efficient Ocean Wave Energy Harvesting

The research team led by Prof. ZI Yunlong has recently overcome the above technical limitations and developed a Water-Tube-Based TENG (WT-TENG) for irregular and low-frequency environmental energy harvesting, such as water waves. They encapsulated water in a Finger-Sized Tube. When water moves in the tube between regions of the two electrodes, triboelectrification happens and electric currents can be generated. Taking advantage of the flexibility of water, the WT-TENG can be operated in various modes, including rotation, swing, seesaw, and horizontal linear modes, to harvest energy from diverse mechanical movements in the environment, such as ocean waves, wind, body and vehicle movements. Due to the high contact intimacy of water and the tube surface, the output volumetric charge density of the WT-TENG is significantly enhanced, reaching 9 mC/m^3 at a frequency as low as 0.25 Hz, which is beyond all previous reports.

Research Interests:

- Triboelectric Nanogenerator
- Energy Harvesting
- Tribophotonics

FINAL YEAR PROJECTS

Robotics for Automatic Operations in Indoor Horticulture Farms

Awardees: AU Tsz Him Vincent, LAU Chun Kit, MAN Cheuk Ying Tiffany, SU Man Ngo Rocco
Award: Third Prize in the 7th Hong Kong University Student Innovation and Entrepreneurship Competition
Supervisor: Prof. LAU Tat Ming Darwin

Short Description:

Most indoor horticulture farms utilize environmental controls to optimize growing environment for better crop quality, which may make human workers unpreferable to work at because of its hygienic and cost issues. An automated model of this kind of farms can allow 24-hour operation of the farm and lower cost in the long run.

The Robotics for Automatic Operations in Indoor Horticulture Farms consist of two parts, a logistics system and a seeding system. The seeding system uses a robot arm to seed automatically onto the seed trays. This system could adapt to different tray's dimensions as user defines them in the program. The core mechanism uses pneumatics to generate negative pressure on the tip of the needles to perform pick-and-place seeds onto seed tray. A unique feature of the design is the seed container, and the needles are merged as an end effector of robot arm. After the seeding is completed, a mobile robot platform from the logistics system will collect the seeded tray and place it on a multi-layer planting rack, which utilizes a queue-like system to manage the harvest schedule. Additional mechanisms such as the mechanical water drain is also included on the planting rack to facilitate the transport process.

Sharing:

We encountered a lot of challenges and obstacles in the prototyping stage. During the prototyping stage, we put theories into practice, polished our skills and obtained many hands-on experiences. This competition was meaningful and inspiring. It gave us a chance to share our FYP to people who are also interested in the field of Mechanical Engineering and Robotics. Passionate judges and participants have given us valuable insights and areas for improvements. Meanwhile, we have learnt a lot of innovative ideas and technology from other teams in different fields, such as Life Science and Computer Science, which broadened our horizons.

Virucidal, Reusable and Cost-Effective Respirator

Awardee: LI Pak Hin
Award: Merit Award in The 7th Hong Kong University Student Innovation and Entrepreneurship Competition
Supervisor: Prof. WONG Hay

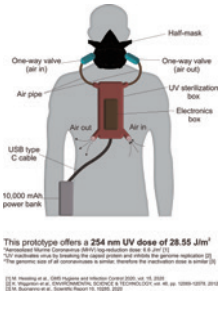
Short Description:

This project aims to develop a virucidal, reusable, and cost-effective mask system to solve the pandemic situation in the world. Disposal masks nowadays could only block viruses from contacting the users. Thus, this project decided to merge the UV system and respirator, so the mask could kill the virus actively.

The prototype has achieved aims in different aspects. The prototype could inactivate coronavirus. The UV dosage needed to inactivate coronavirus was 6.6 J/m^2, and the UV dosage given from the prototype was 28.55 J/m^2. The prototype was reusable as all components were replaceable. By using a 10000mah power bank, the prototype can be used for 12.5 hours. The cost of the prototype was around HK$900, and considering the non-reusable part, it only costed HK$0.4 per day which was cost-effective. Users can carry the prototype because it was about 0.7kg only. By improving this prototype in the future, it may prevent the next pandemic situation in the world.

Sharing:

In this project, I have learnt how to develop a product step by step. From generating ideas, researching useful information, to designing and developing the prototype, I have gained hands-on experience not only in mechatronic design, but also in material selection and fabrication methods. Finally, I would like to thank my supervisor, Professor WONG Hay, and the MAE Department for giving me the chance to participate in this meaningful project.

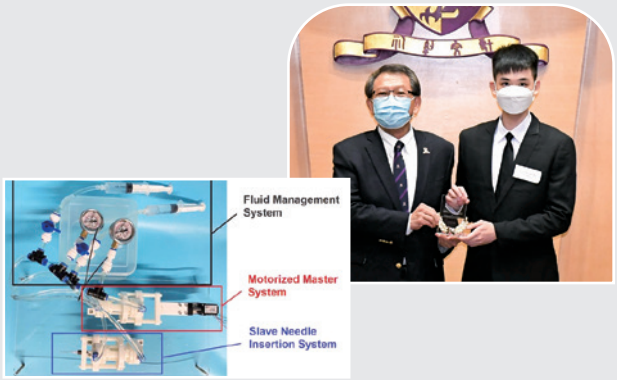


Teleoperated MRI-Compatible Needle Insertion Robot

Awardee: LIN Kwan Kit
Award: First Runner-up & Special Award (Undergraduate Individual) in Professor Charles K. Kao Student Creativity Award, CUHK
Supervisor: Prof. CHENG Shing Shin

Short Description:

The teleoperated MRI-Compatible Needle Insertion Robot is a system that motorizes an MRI-Compatible Duo-Acting Hydraulic System to perform precise real-time needle-based procedure inside an MRI scanner. The Duo-Acting Hydraulic System can transmit pressure from one side to the other with fluid quickly, accurately and stably. The pressurised rolling diaphragms can push and pull the pistons simultaneously to achieve motion transmission. The Hydraulic System has improvements in stability and cost with a double glass ball bearing design and silicone rolling diaphragm. By motorizing the system, the precise motion of an MRI unsafe linear actuator can be transmitted to the MRI safe needle insertion system to perform the precise real-time needle-based procedure. The robot can be controlled by a computer with data input or a joystick to achieve teleoperating. With this robot, the surgeon can perform the operation inside the control room and check the real-time result. The safety, accuracy, time cost and economic cost of the operation can be improved with this robot.

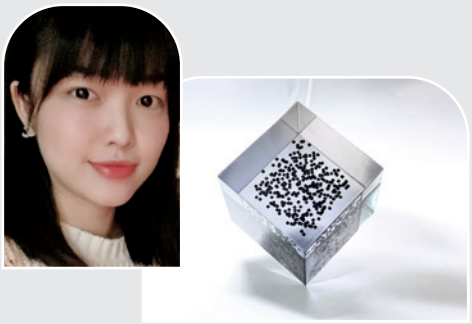


Sharing:

The most challenging part of this project is the trial-and-error process. Same as many researches, the ideal design might sound very good and feasible but the actual result is not. I had to learn from all the mistakes and design something new to improve them again and again. Thanks to my supervisor Prof. CHENG Shing Shin and his research team, their advice, technical support and encouragement had helped me a lot. Winning the prize has strengthened the affirmation of my ability and makes me more interested in the field of research and design.

Embedding 3D Security Features in 3D-Printed Parts for Enhanced Product Authentication

Awardee: LEUNG Chiu Man
Award: First Runner-up (Undergraduate Individual) in Professor Charles K. Kao Student Creativity Award, CUHK
Supervisor: Prof. SONG Xu



Short Description:

My project aims to investigate the effectiveness and feasibility of embedding 3D security features, in forms of 3D QR code, and in 3D-printed parts by taking advantages of the additive nature of the 3D printing technology. An algorithm is developed to automate the whole process, which includes importing the STL file of the object to be printed, generating a 2D QR code that is unique to each product, transforming the 2D QR code to a 3D model, embedding the 3D model of the QR code to the imported STL file and finally exporting the model as a STL file that is suitable to be 3D printed.

Sharing:

To me, participating in the Professor Charles K. Kao Student Creativity Awards was very challenging as I expected to compete with a lot of creative projects that were very impactful in changing people's everyday life. I worked hard on my project so I could come up with more quality and creative ideas. Also, I practiced my presentation skills in Mandarin. The impromptu Q and A Session was also valuable to my project as the judges raised questions that I had not thought about before, their critical questions allowed me to view my project from a different angle and guided me to the ways of improvement.

FEATURE AWARDS

THE CUHK ROBOCON TEAM

About the CUHK Robocon Team

The CUHK Robocon team has participated in the Robocon Hong Kong Contest since 2004. Our team builds robots to complete tasks in competitions, in which students solve engineering problems by coming up with innovative ideas.

Currently, most of the team members are majoring in Mechanical and Automation Engineering, while others come from different faculties and departments including Computer Science, Electronic Engineering, etc.

CUHK Robocon Team Hong Kong

Read more

2019 Competitions

Robocon 2019 Hong Kong Contest

The CUHK Robocon Team – *Phantom Dancer* competed with 12 other teams in the Robocon 2019 Hong Kong Contest. They built a robot that could go through different obstacles, throw shagai and pick up objects. Not only did the Team control the robot through the obstacle course precisely, but also come first in the course! *Phantom Dancer* was crowned **Champion**.

Read more

The Asia-Pacific Broadcasting Union (ABU) Asia-Pacific Robot Contest 2019 – Mongolia

Having won the Robocon 2019 Hong Kong Contest, the CUHK Robocon Team represented Hong Kong to compete in the ABU Asia-Pacific Robot Contest 2019 in Mongolia.

The Team strove to upgrade their robots' performance and conducted repetitive trials to minimize failure rates. The improved stability eventually gave the Team's robots advantages over traditional strong opponents like China, Vietnam and Japan. The Team defeated 17 regional winning teams from universities, colleges and academies of 16 countries across the Asia-Pacific region and was crowned **Champion** for the first time as Hong Kong Team!

Team Members:
Phantom Dancer

Mr. TONG Chi Sang Hezekiah	UG, MAEG
Mr. HO Siu Sum	UG, MAEG
Mr. CHEUNG Chun To	UG, MAEG
Mr. WONG Wai Chiu	UG, MAEG
Mr. LEUNG Kwok Po	UG, MAEG
Miss YEUNG Ka Long	UG, MAEG
Mr. WONG Fei Yan Fiat	UG, MAEG
Miss MAN Cheuk Ying Tiffany	UG, MAEG
Mr. LIU Ho Man	UG, CSCI
Mr. WONG Tsz Hin	UG, CSCI
Mr. LAM Chun Ting Jeff	UG, CSCI
Mr. CHEUNG Tsang Kit	UG, CSCI
Mr. CHEUNG Kam Ho	UG, CSCI
Mr. KWOK Pok Man Kendrick	UG, CSCI
Miss WONG Sin Yi	UG, CSCI
Mr. CHEUNG Chi Hang Calvin	UG, CSCI
Mr. CHAN Yin Ching	UG, CENG
Mr. LEUNG Chung Him	UG, CENG
Mr. CHEUNG Ka Wing	UG, IERG
Mr. NG Pui Hin	UG, BERG
Mr. OUYANG Jianlin	UG, IFAA

2020 Competitions

Robocon 2020 Hong Kong Contest

Our two CUHK Robocon Teams, *Power Shuttle and Black Horse Matter* proudly represented CUHK in the Robocon 2020 Hong Kong Contest. Despite enduring through COVID-19, *Black Horse Matter* demonstrated their determination and excellence during the contest. They achieved **the 1st Runner-up** in the contest.

Team Members:
Black Horse Matter

Mr. WONG Fei Yan Fiat	UG, MAEG
Mr. LIU Yuk Hei	UG, MAEG
Mr. CHEUNG Chun To	UG, MAEG
Mr. SIU Shi Pan	UG, MAEG
Miss HO Hei Man Erica	UG, EE
Mr. LAM Chun Ting Jeff	UG, CSCI
Miss WONG Sin Yi	UG, CSCI
Mr. KWOK Pok Man Kendrick	UG, CSCI
Mr. LAM Shi Shing	UG, CSCI
Mr. SO Siu Ho Aeon	UG, IERG
Miss CHEUNG So Yee	UG, PHYS
Miss FENG Yalei	UG, M.B.,Ch.B.
Miss CHAN Siu Ting	UG, M.B.,Ch.B.
Miss WONG Chi Ka	UG, M.B.,Ch.B.

The Asia-Pacific Broadcasting Union (ABU) Asia-Pacific Robot Contest 2020 – Fiji

The CUHK Robocon Team got the chance to represent Hong Kong in the ABU Asia-Pacific Robot Contest 2020 in Fiji. Due to the COVID-19 pandemic, the contest was held online as "ABU Robocon Festival" in December 2020. Nevertheless, the Team remained excited and determined. They won **the Special Award** by Panasonic System Solutions Japan Co., Ltd. in the contest!

Team Members:
Black Horse Matter

Mr. WONG Fei Yan Fiat	UG, MAEG
Mr. LIU Yuk Hei	UG, MAEG
Mr. CHEUNG Chun To	UG, MAEG
Mr. SIU Shi Pan	UG, MAEG
Miss HO Hei Man Erica	UG, EE
Mr. LAM Chun Ting Jeff	UG, CSCI
Miss WONG Sin Yi	UG, CSCI
Mr. KWOK Pok Man Kendrick	UG, CSCI
Mr. LAM Shi Shing	UG, CSCI
Mr. SO Siu Ho Aeon	UG, IERG
Miss CHEUNG So Yee	UG, PHYS
Miss FENG Yalei	UG, M.B.,Ch.B.
Miss CHAN Siu Ting	UG, M.B.,Ch.B.
Miss WONG Chi Ka	UG, M.B.,Ch.B.

2021 Competition

Robocon 2021 Hong Kong Contest

Silver Striker and *The Invincibles*, the CUHK Robocon Teams proudly represented The Chinese University of Hong Kong in the Robocon 2021 Hong Kong Contest. After numbers of sleepless nights, the Teams designed and built Robots that could throw arrows into pots precisely. *The Invincibles* achieved **the 3rd Runner-up** while *Silver Striker* won **the Best Performance Award, the Best Team Spirit Award** and was crowned **Champion** in the contest.

Team Members:
Silver Striker

Miss SHEA Yi Yui	UG, MAEG
Miss NG Hui Yin	UG, MAEG
Mr. CHOW Tsun Yu	UG, MAEG
Mr. YAU Hung Kei	UG, MAEG
Mr. SO Yan Shun	UG, BERG
Mr. KWOK Lam Him	UG, AIST
Mr. SHEK Tsz Him	UG, AIST
Mr. YIP Tin Yui	UG, AIST
Mr. WONG Tsz Sun	UG, CSCI
Miss CHO Man Yan	UG, EE
Mr. YEUNG Yuk Lun	UG, EE
Mr. LAU Yuk Chun Isaac	UG, EE
Mr. CHAN Wing Fung	UG, EE
Miss CHAN Yi Man	UG, BERG
Mr. LO Kwan Wai	UG, DSPS

Team Members:
The Invincibles

Mr. FAN Chun Yin	M. Phil., MAE
Mr. LIU Yuk Hei	UG, MAEG
Mr. WONG Fei Yan Fiat	UG, MAEG
Mr. NG Pui Hin	UG, MAEG
Mr. LEUNG Chung Him	UG, CENG
Mr. CHAN Yik Ching	UG, CENG
Miss CHEUNG So Yee	UG, PHYS
Mr. OUYANG Jianlin	UG, IFAA
Miss HO Hei Man Erica	UG, EE
Mr. SIN Chun Him	UG, EE
Mr. MAN Tui Dor	UG, EE
Mr. TONG Tsz Hin	UG, CSCI
Miss FENG Yalei	UG, M.B.,Ch.B.
Mr. LEUNG Wallace Chak Sum	UG, M.B.,Ch.B.
Miss CHAN Siu Ting	UG, M.B.,Ch.B.
Miss WONG Chi Ka	UG, M.B.,Ch.B.

Team Members sharing (1)

Name: FAN Chun Yin
Major: B.Eng. in Mechanical and Automation Engineering (2016 – 2020)
M.Phil. in Mechanical and Automation Engineering (2020 – present)
Join the Team: 2018-2021
Robocon Team: Phantom Dancer (2018-2020) and Power Shuttle (2020-2021)

I have been in the CUHK Robocon Team for 4 years, starting as a normal team member to becoming the team leader and now co-instructor. The CUHK Robocon Team provides a very comprehensive introduction to the world of Engineering. It offers a platform to us to put theories into practice: from mechanical design to fabrication, and from embedded system programming to control system design. What is more, the CUHK Robocon Team is a great cornerstone for my postgraduate research.

Joining the Robocon contests is also a one-of-a-kind experience. I remember spending months in the Robocon laboratory, perfecting the robot design with teammates who are also great friends of mine now! Going through one iteration after another, we witnessed how our robot improved gradually. Then the competition was here. When we presented the fruit of our hard labour to the world and it worked, the experience was truly thrilling.

Team Members sharing (2)

Name: WONG Fei Yan Fiat
Major: B.Eng. in Mechanical and Automation Engineering
Join the Team: 2018-2021
Robocon Team: Power Shuttle

I have joined the CUHK Robocon Team for 4 years. When I was a freshman, I saw the CUHK Robocon Team recruitment poster in an elevator, I was so intrigued by it that I decided to join the Team. Although the tasks were challenging, I enjoyed my time in the CUHK Robocon Team a lot because I learned a lot of technical skills, different knowledge as well as team work. I built good relationships with team members too!

One of the most memorable experiences was when we practiced our robots outdoor once, and we were bitten by so many mosquitoes while we were assembling, testing, and practising the robots! It was an itchy but fun experience. Thanks to the MAE Department for the support, we now have a safe and well-equipped laboratory to work on our ideas.

THE INTERNATIONAL EXHIBITION OF INVENTIONS OF GENEVA 2021

About International Exhibition of Inventions of Geneva

The International Exhibition of Inventions of Geneva is the most important annual event in the world devoted exclusively to inventions. Innovations are exhibited for the first time.

Gold Medal

"Self-Powered Smart Watch and Wristband Enabled by Embedded Generator"

Research Team Tembers: Professor LIAO Wei-Hsin, Dr. CAI Mingjing and Dr. WANG Jiahua

A research team led by Prof. LIAO Wei-Hsin has developed an embedded energy harvester which is very efficient in generating electricity to sustainably power the smart watches and wristbands.

The research team has proposed a highly compact embedded generator, equipped with a motion capture unit, a magnetic frequency-up converter and a power generation unit, together with coaxial topology. Thanks to the magnetic frequency-up converter, the energy harvester is highly compact and has a very high normalized power density. Although the total volume of the harvester is 5cm^3, it can still achieve 1.74mW power output. The power density is ten times that of the existing devices. Benefiting from high power output and power density, the energy harvesting system can be easily embedded in the smart watches and wristbands to provide sustainable power supply.

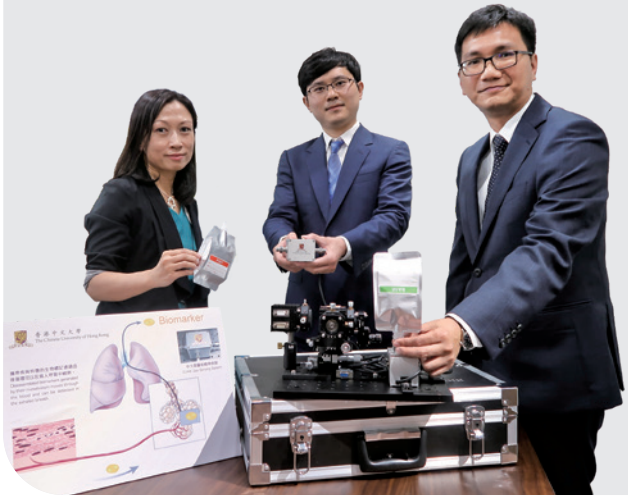
Read more

Gold Medal

"Highly Sensitive Gas Sensing and Control System"

Research Team Members: Professor REN Wei and Dr. XU Ke

A research team led by Prof. REN Wei has invented a portable and highly sensitive gas sensing system that can measure trace amount of harmful gas components such as carbon monoxide, nitric oxide, ammonia, sulfur dioxide in real time. It has adopted an advanced laser spectroscopic technology and artificial intelligence algorithm allowing direct application to the fields of environmental protection and medical treatment, including exhaust monitoring in power plants, the petrochemical industry and vehicle emission, as well as components monitoring in patient breath.



The research team has made use of the cutting-edge cavity-enhanced photoacoustic spectroscopy and multipass absorption spectroscopy to develop different types of portable gas sensing system. One single inspector is able to carry this device to homes, offices, schools, hospitals and even onto transportation for in-depth inspections. When coupled with smart and remote data processing and transfer, the device can also be delivered by unmanned drones, or controlled remotely, to enter tunnels, faraway locations or disaster-afflicted areas to carry out real-time analysis and locate colourless and odourless pollutants, thereby preventing accidents related to gas anomalies.

The system provides:

- Simultaneous detection of multiple target gases generated by thermal power plants, industrial boilers and oil companies
- Ultra-high sensitivity required in industrial processes (sub-ppb)
- Real-time online sensing (response time < 3 s)

Read more

Silver Medal

"Harvesting Energy from Walking Human Body"

Read more

Research Team Members: Professor LIAO Wei-Hsin, Dr. GAO Fei, LIU Gaoyu, CHUNG Brendon Lik-Hang and CHAN Hugo Hung-Tin

A research team led by Prof. LIAO Wei-Hsin has developed a lightweight smart materials-based energy harvester for scavenging energy from human motion, generating inexhaustible and sustainable power supply just from walking. Specifically, the device can capture biomechanical energy from the motion of the human knee and then convert it to electricity which can be used to power wearable electronics such as pedometers, health monitors, and GPS.

Piezoelectric macro fiber composites are lightweight materials, which can produce electricity under deformation. The proposed energy harvester employs a bending beam and a slider-crank mechanism to capture the motion of the human knee when walking. Then, the captured motion is used to deform piezoelectric macro fiber composites pieces bonded to the bending beam so that electricity is produced when the human knee flexes or extends.

Bronze Medal

"QuickCAS: An Easy-To-Use Analysis System for Quick Detection of Infectious Pathogens in Clinical Samples"

Research Team Members: Professor ZHANG Li, Dr YANG Lidong and LIU Wai Shing, from the Department of Mechanical and Automation Engineering; Professor SUNG Jao Yiu, Emeritus Professor of CUHK; Dr. WONG Hei, from the Department of Medicine and Therapeutics, Faculty of Medicine; Professor CHIU Wai Yan, Dr CHAN Kai Fung, from the Chow Yuk Ho Technology Centre for Innovative Medicine, Faculty of Medicine; and Professor IP Margaret, Department of Microbiology, Faculty of Medicine

Professor ZHANG Li and collaborators from Faculty of Medicine have developed a rapid, fully automated and low cost microrobotic diagnostic system with comparable sensitivity and specificity to clinical detection methods. As the COVID-19 pandemic rages worldwide, rapid testing with automated detection systems is urged for effective diagnosis and infection control. Delayed diagnosis not only further burdens the healthcare system but might also cost patients' life.

The innovative microrobotic diagnostic system (QuickCAS) integrates the novel fluorescent microrobotic sensing probes (microrobots) with an external magnetic actuation system to detect specific pathogens in a short time. The microrobots are G. lucidum spores coated by a layer of iron oxide nanoparticles and functionalized with carbon dots. By analyzing the changes in the fluorescence signal of the microrobots, the system can determine the presence of pathogen in patients' samples. In addition, the system uses an external magnetic field to remotely actuate the microrobots, speeding up the fluorescence quenching and thus shortening the detection time to as quick as 15mins.

Besides speed and cost advantages, this technology requires no specialist to operate and involves only 4 simple steps in sample preparation. QuickCAS automated the aforementioned detection and analysis process which reduces the infection risk of technician during detection due to minimized exposure. The research team is now studying the application of this microrobotic system with medical doctors for multiple pathogens including the COVID-19.

Read more

HONOURS & AWARDS

DATE	NAME OF AWARDEE	TITLE	PRIZE / AWARD / HONOUR
Jul-19	Dr. CONG Guangtao (Supervisor: Prof. LU Yi-Chun)	Ph.D., MAE (2018) Faculty Member	CUHK Young Scholars Thesis Award 2018
Jul-19	Dr. YU Jiangfan (Supervisor: Prof. ZHANG Li)	Ph.D., MAE (2018) Faculty Member	CUHK Postgraduate Research Output Award 2018
Jul-19	Dr. YU Junjun (Supervisor: Prof. REN Wei)	Research Staff Faculty Member	Hong Kong Special Administrative Region Government Scholarship Reaching Out Award
11-Jul-19	Mr. JIN Dongdong (Supervisor: Prof. ZHANG Li)	Ph.D., MAE Faculty Member	Second Place of the Best Poster Award at the IEEE/ ASME International Conference on Advanced Intelligent Mechatronics (AIM) 2019
11-Jul-19	Dr. HAN Dongkun	Faculty Member	O. Hugo Schuck Best Paper Award for the Paper "Permissive Barrier Certificates of Safe Stabilization Using Sum-of-Squares"
25-Aug-19	Mr. JIN Dongdong (Supervisor: Prof. ZHANG Li)	Ph.D., MAE Faculty Member	Best Poster Award at the 2nd International Conference on Micro/Nano Machines Committee for the Paper "Reconfigurable Microswarm Mimics the Structure and Function of Ant Bridge in Electronic Devices"
29-Aug-19	Mr. NG Kwun Wang Mr. SONG Chen Mr. WANG Tianqi	Ph.D., MAE Ph.D., MAE Ph.D., MAE	Department Excellent Tutor Award (2018-19), CUHK
24-Sep-19	Mr. JIN Dongdong Dr. YU Jiangfan Prof. ZHANG Li	Ph.D., MAE Research Staff Faculty Member	First Prize at the International Bionic Innovation Competition 2019 for the Work "Mimicking the Structure and Function of Ant Bridge in Magnetic Microswarm for Electronic Applications"
Oct-19	Prof. LU Yi-Chun	Faculty Member	National Natural Science Foundation of China (NSFC) Excellent Young Scientists Fund (Hong Kong and Macao)
Oct-19	Miss XIA Tongling	Ph.D., MAE	ISIAQ Student Travel Award, International Society of Indoor Air Quality and Climate (ISIAQ), 2019
10-Oct-19	Prof. LAU Tat Ming Darwin	Faculty Member	2019 UGC Teaching Award (Early Career Faculty Members)
26-Oct-19	Dr. LI Yiyang Prof. XU Dongyan Mr. LEUNG Yun Yee Martin Mr. YU Siu Ning Mr. AU Tsz Him Vincent Mr. FAN Chun Yin Mr. HO Siu Sum Mr. NG Pui Hin	Faculty Member Faculty Member Senior Technician (Assessor) Technician UG, MAEG UG, MAEG UG, MAEG UG, MAEG	First Prize and Best Cooperation Award in the "Pick and Place" Category at the Guangdong-Hong Kong-Macao Undergraduate Engineering Training Integration Ability Competition 2019
26-Oct-19	Prof. XU Dongyan Dr. LI Yiyang Mr. YU Siu Ning Mr. LEUNG Yun Yee Martin Mr. CHAN Po Wah Mr. KWOK Chun Keung Mr. LAW Tsz Lung Miss WONG Po Ting	Faculty Member Faculty Member Technician Senior Technician (Assessor) UG, MAEG UG, MAEG UG, MAEG UG, MAEG	Best Cooperation Award in the "Energy Relay" Category at the Guangdong-Hong Kong-Macao Undergraduate Engineering Training Integration Ability Competition 2019

2019 UGC Teaching Award

Best Cooperation Award

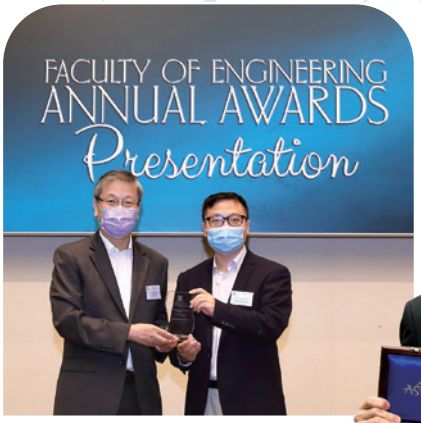
Dean's Exemplary Teaching Awards 2019

First-class Award at the 6th HK University Student Innovation and Entrepreneurship Competition

CAA Excellent PhD Thesis Supervisor Award

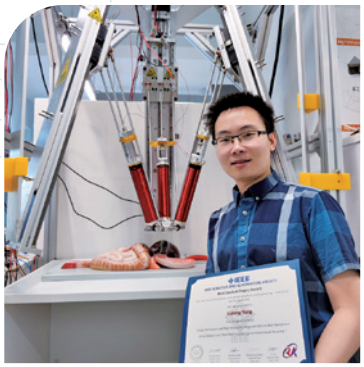
DATE	NAME OF AWARDEE	TITLE	PRIZE / AWARD / HONOUR
7-Nov-19	Prof. LAU Tat Ming Darwin	Faculty Member	University Education Award 2019, CUHK
23-Nov-19	Prof. HUANG Jie	Faculty Member	The Chinese Association of Automation (CAA) Excellent PhD Thesis Supervisor Award
23-Nov-19	Dr. LIU Tao	Ph.D., MAE (2018)	The Chinese Association of Automation (CAA) Excellent PhD Thesis Award
Dec-19	Mr. SUN Guangli Mr. CHEN Zhi Mr. YU Zhen Mr. ZHOU Yang Mr. YUE Linzhu Prof. LIU Yunhui	Ph.D., MAE MSc., MAE Ph.D., MAE Ph.D., MAE Ph.D., MAE Faculty Member	Best Paper Finalist in 2019 IEEE International Conference on Robotics and Biomimetics
Jan-20	Prof. WANG Changling Charlie	Faculty Member	The ISSMO/Springer Prize at 13th World Congress of Structural and Multidisciplinary Optimization, 2019
Mar-20	Prof. ZHANG Li	Faculty Member	The IEEE Nanotechnology Council (IEEE NTC) Distinguished Lecturer for 2020
Mar-20	Dr. HAN Dongkun	Faculty Member	Dean's Exemplary Teaching Awards 2019, CUHK
Mar-20	Mr. NG Kwun Wang	Ph.D., MAE	Faculty Outstanding Tutor Award 2019, CUHK
Apr-20	Prof. Adam FINGRUT Prof. LAU Tat Ming Darwin	Assistant Professor, School of Architecture Faculty Member	Winner ("Conceptual Design – Small" Category) for YES Pavilion project, S.ARCH 2020, 7th International Conference on Architecture and Built Environment with Architecture Awards
29-May-20	Mr. KWOK Chun Keung (Supervisor: Prof. LAU Tat Ming Darwin)	UG, MAEG Faculty Member	Third-class Award (Category: Innovation) at the 6th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Modularized ROV
29-May-20	Dr. XU Ke (Supervisor: Prof. REN Wei)	Ph.D., MAE (2020) Faculty Member	First-class Award (Category: Entrepreneurship) at the 6th Hong Kong University Student Innovation and Entrepreneurship Competition Project: LaSense Ultra-sensitive Gas Sensing and Control System
29-May-20	Mr. LI Haoran (Supervisor: Prof. CHEN Yongsheng)	Ph.D., MAE Faculty Member	Third-class Award (Category: Innovation) at the 6th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Annealing of Strontium Titanate Based Thermoelectric Materials by Graphite Mechanistic Analysis by Spectroscopic and Chromatographic Techniques
29-May-20	Mr. GU Songyun Mr. CHEN Bingxu Mr. LAI Huasheng (Supervisor: Prof. CHEN Shih-Chi)	Ph.D., MAE Ph.D., MAE Ph.D., Surgery Faculty Member	Merit Award (Category: Innovation) at the 6th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Portable Microscope System for Real-Time Aerosol Measurement

DATE	NAME OF AWARDEE	TITLE	PRIZE / AWARD / HONOUR
Jun-20	Dr. YU Jiangfan Prof. ZHANG Li	Ph.D., MAE (2018) Faculty Member	2020 Best Paper Award Finalist, IEEE/ASME Transactions on Mechatronics for the paper entitled "Reversible Swelling and Shrinking of Paramagnetic Nanoparticle Swarms in Biofluids with High Ionic Strength"
5-Jun-20	Dr. ZHOU Shunbo	Ph.D., MAE (2020)	Best Paper Award - Honorable Mention, IEEE Robotics and Automation Letters
30-Jun-20	Dr. LI Zhejun (Supervisor: Prof. LU Yi-Chun)	Ph.D., MAE Faculty Member	Faculty Outstanding Thesis Award 2019, CUHK
30-Jul-20	Prof. ZHANG Li	Faculty Member	Research Excellence Award 2019-20 in the Faculty of Engineering, CUHK
30-Jul-20	Prof. CHEN Shih-Chi	Faculty Member	Young Researcher Award 2019, CUHK
4-Aug-20	Dr. HAN Dongkun Mr. LEUNG Yun Yee Martin	Faculty Member Senior Technician	Poster Award in the Teaching and Learning Expo 2019/20, CUHK
21-Aug-20	Miss XIA Xin (Supervisor: Prof. ZI Yunlong)	Ph.D., MAE Faculty Member	優勝獎 in the iCANX Academic League
24-Aug-20	Prof. CHEN Shih-Chi	Faculty Member	第十一屆中國發明協會發明創業獎 —— 人物獎
Sep-20	Prof. LIAO Wei-Hsin	Faculty Member	2020 ASME Adaptive Structures and Material Systems Award
1-Sep-20	Mr. JIANG Yilei (Supervisor: Dr. HAN Dongkun)	UG, AI Faculty Member	Best Project Award in UG Summer Research Internship 2020, Faculty of Engineering, CUHK
3-Sep-20	Dr. YANG Lidong (Supervisor: Prof. ZHANG Li)	Ph.D., MAE (2020) Faculty Member	Best Student Paper Award in IEEE International Conference on Automation Science and Engineering 2020
11-Sep-20	Mr. WU Jiahao	Ph.D., MAE	Best Paper Finalist in 2020 IEEE International Conference on Intelligent Robots and Systems
6-Nov-20	Prof. LU Yi-Chun	Faculty Member	Top 10 winners of Falling Walls – Science Breakthroughs of the Year in Engineering & Technology
19-Nov-20	Dr. LIU Wei Prof. HUANG Jie	Research Staff Faculty Member	Recruitment Programme for Young Professionals
26-Nov-20	Dr. XU Ke (Supervisor: Prof. REN Wei)	Ph.D., MAE (2020) Faculty Member	CUHK 2020 Outstanding Student Award
20-Dec-20	Dr. YANG Lidong Dr. YU Jiangfan Mr. DU Xingzhou Mr. CHAN Kai Fung Prof. CHIU Wai Yan Philip Prof. ZHANG Li	Ph.D., MAE (2020) Ph.D., MAE (2018) Ph.D., BME Ph.D., BME Professor, Department of Surgery, Faculty of Medicine Faculty Member	Toshio Fukuda Best Paper Award in Mechatronics in 2020 IEEE International Conference on Advanced Robotics and Mechatronics



Research Excellence Award
2019-20

2020 ASME Adaptive Structures
and Material Systems Award



Best Student Paper Award in IEEE
International Conference on
Automation Science and Engineering

DATE	NAME OF AWARDEE	TITLE	PRIZE / AWARD / HONOUR
2-Dec-20	Dr. XU Ke (Supervisor: Prof. REN Wei)	Ph.D., MAE (2020) Faculty Member	Gold Medal at the 12th Challenge Cup China University Student Entrepreneurship Plan Competition
14-Dec-20	Dr. XU Ke (Supervisor: Prof. REN Wei)	Ph.D., MAE (2020) Faculty Member	Grand Prize (Category: Entrepreneurship) at the 6th Hong Kong University Student Innovation and Entrepreneurship Competition
18-Dec-20	Prof. CHEN Benmei	Faculty Member	Fellow of The Academy of Engineering Singapore
14-Jan-21	Mr. HAYAMI Yusuke (Supervisor: Prof. Juan ROJAS)	Ph.D., Osaka University Faculty Member	Best Paper Award Finalist in IEEE/SICE Internatonal Symposium on System Integration
29-Jan-21	Prof. ZHANG Li	Faculty Member	IEEE Nanotechnology Council (IEEE NTC) Distinguished Lecturer for 2021 (Reappointed)
29-Jan-21	Prof. ZI Yunlong	Faculty Member	Vebleo Fellow
6-Mar-21	Mr. HEIBA Serageldin Amre Abdelaziz	UG, EEEN	Gold Award of the General Education Best Essay Award of 2019-2020, CUHK – In Dialogue with Nature for the Essay "Man, Nature, and COVID-19: The Origins and Resolutions of the Pandemic"
6-Mar-21	Mr. JEON Min-gyu	UG, EEEN	Bronze Award of the General Education Best Essay Award of 2018-2019 (CUHK) – In Dialogue with Humanity for the Essay "The Only Thing We Have to Fear is Fear Itself"
11-Mar-21	Power Shuttle	The CUHK Robocon Team	Champion in the Hong Kong Science Park "Human x Robot Basketball Competition"
27-Mar-21	Mr. CHENG Mau Lim Mr. WONG Ka Tik Mr. WONG Man Hin Prof. XU Dongyan Dr. LI Yiyang Mr. LEUNG Yun Yee Martin Mr. YU Siu Ning	UG, MAEG UG, MAEG UG, MAEG Faculty Member Faculty Member Senior Technician Technician	2nd Runner-Up Award in the 9th Greater China Design Competition
18-Apr-21	Miss WANG Xingyu Mr. WANG Wenhao Miss KWOK Tien Wing Mr. CHEN Yiwei Prof. XU Dongyan Dr. LI Yiyang Mr. LEUNG Yun Yee Martin Mr. YU Siu Ning	UG, MAEG UG, MAEG UG, MAEG UG, EEEN Faculty Member Faculty Member Senior Technician Technician	Second Prize Award in the "Intelligent +" Category: intelligent logistics handling, in the 2020 Guangdong-Hong Kong-Macao Undergraduate Engineering Training Integration Ability Competition
26-Apr-21	Prof. LU Yi-Chun	Faculty Member	Fellow of the Royal Society of Chemistry
29-Apr-21	Miss FU Jingjing (Supervisor: Prof. ZI Yunlong)	Ph.D., MAE Faculty Member	Symposium Best Presentation Award in 2021 Virtual MRS Spring Meeting and Exhibit
21-May-21	Prof. KWOK Tsz-Ho	Ph.D., MAE (2013); Associate Professor, Department of Mechanical, Industrial and Aerospace Engineering at Concordia University	2021 SME Geoffrey Boothroyd Outstanding Young Manufacturing Engineer Award
28-May-21	Mr. LIN Kwan Kit (Supervisor: Prof. CHENG Shing Shin)	UG, MAEG Faculty Member	First Runner-up and Special Award (Undergraduate Individual) at the Professor Charles K. Kao Student Creativity Awards 2021, CUHK Project: Teleoperated MRI-Compatible Needle Insertion Robot

2021 SME Geoffrey Boothroyd Outstanding Young Manufacturing Engineer Award

Professor Charles K. Kao Student Creativity Awards: First Runner-up

Professor Charles K. Kao Student Creativity Awards: Merit Award

Third Prize at the 7th HK University Student Innovation and Entrepreneurship Competition

First Prize at the 7th HK University Student Innovation and Entrepreneurship Competition

DATE	NAME OF AWARDEE	TITLE	PRIZE / AWARD / HONOUR
28-May-21	Miss LEUNG Chiu Man (Supervisor: Prof. SONG Xu)	UG, MAEG Faculty Member	First Runner-up (Undergraduate Individual) at the Professor Charles K. Kao Student Creativity Awards 2021, CUHK Project: Embedding 3D Security Features in 3D-Printed Parts for Enhanced Product Authentication
28-May-21	Mr. LAM Chun Kit (Supervisor: Prof. CHENG Shing Shin)	UG, MAEG Faculty Member	Merit Award (Undergraduate Individual) at the Professor Charles K. Kao Student Creativity Awards 2021, CUHK Project: A Robotic Armrest for Surgery
28-May-21	Mr. SIU Shi Pan Miss WONG Chi Ka Miss LEE Tsz Yan Miss WONG Sin Yi	UG, MAEG UG, M.B., CH. B. UG, CSCI UG, CSCI	Merit Award (Undergraduate Group) at the Professor Charles K. Kao Student Creativity Awards 2021, CUHK Project: Gecko-Inspired Universal Soft Robotics Gripper for the Physically Challenged
28-May-21	Mr. WANG Yan Mr. LIN Hongbin Mr. WANG Xuchen (Supervisor: Prof. AU Kwok Wai Samuel)	Ph.D., MAE Ph.D., MAE Ph.D., MAE Faculty Member	First Runner-up (Postgraduate Group) at the Professor Charles K. Kao Student Creativity Awards 2021, CUHK Project: Miniaturized Robotic Tendon-Driven Articulated Surgical Drill for Confined-Space Bone Work
28-May-21	Mr. YAN Wanquan (Supervisor: Prof. CHENG Shing Shin)	Ph.D., MAE Faculty Member	Merit Award (Postgraduate Individual) at the Professor Charles K. Kao Student Creativity Awards 2021, CUHK Project: Automated Ultrasound-Guided Needle Tip Tracking System
28-May-21	Mr. LIU Kangcheng (Supervisor: Prof. CHEN Benmei)	Ph.D., MAE Faculty Member	Merit Award (Postgraduate Individual) at the Professor Charles K. Kao Student Creativity Awards 2021, CUHK Project: A Simulation Framework for Unmanned Aerial/ Ground Vehicles Vision-Based and LiDAR-Based Applications
29-May-21	Mr. SIU Shi Pan Mr. NG Pui Hin Miss LEE Tsz Yan Miss WONG Sin Yi Miss CHEUNG So Yee Miss WONG Chi Ka (Supervisor: Prof. LIU Yuhui)	UG, MAEG UG, MAEG UG, CSCI UG, CSCI UG, PHYS UG, M.B., CH. B. Faculty Member	Third Prize (Category: Innovation) at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Versatile Soft Robotic Upper Limb Assistive Device for the Physically Challenged
29-May-21	Mr. SU Man Ngo Rocco Mr. LAU Chun Kit Miss MAN Cheuk Ying Tiffany Mr. AU Tsz Him Vincent (Supervisor: Prof. LAU Tat Ming Darwin)	UG, MAEG UG, MAEG UG, MAEG UG, MAEG Faculty Member	Third Prize (Category: Innovation) at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Robotics for Automatic Operations in Indoor Horticulture Farms
29-May-21	Mr. LI Pak Hin (Supervisor: Prof. WONG Hay)	UG, MAEG Faculty Member	Merit Award (Category: Innovation) at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Virucidal, Reusable and Cost-Effective Respirator
29-May-21	Mr. WANG Yan Mr. LIN Hongbin Mr. WANG Xuchen (Supervisor: Prof. AU Kwok Wai Samuel)	Ph.D., MAE Ph.D., MAE Ph.D., MAE Faculty Member	First Prize (Category: Innovation) at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Miniaturized Robotic Steerable Surgical Drill for Confined-Space Bone Work

DATE	NAME OF AWARDEE	TITLE	PRIZE / AWARD / HONOUR
29-May-21	Mr. YAN Wanquan (Supervisor: Prof. CHENG Shing Shin)	Ph.D., MAE Faculty Member	Second Prize (Category: Innovation) at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Automated Ultrasound-Guided Needle Tip Tracking System
29-May-21	Mr. LIU Kangcheng (Supervisor: Prof. CHEN Benmei)	Ph.D., MAE Faculty Member	Third Prize (Category: Innovation) at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition Project: A General Framework for Robotics Vision-based and Lidar-based Applications
29-May-21	Mr. CHAN Hugo Hung-Tin (Supervisor: Prof. LIAO Wei-Hsin)	Ph.D., MAE Faculty Member	Merit Award (Category: Innovation) at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition Project: Knee Energy Harvester with Variable Transmission from Walking
31-May-21	Mr. LU Bo Prof. LIU Yunhui Mr. LONG Yonghao Ms. JIN Yueming Prof. DOU Qi Prof. HENG Pheng Ann Ms. WU Jie Ying Prof. UNBERATH Mathias	Research Staff Faculty Member Ph.D., CSE Research Staff, CSE Assistant Professor, Department of Computer Science and Engineering Professor, Department of Computer Science and Engineering Ph.D., Department of Computer Science at Johns Hopkins University Assistant Professor, Department of Computer Science at Johns Hopkins University	Best Paper Award in Medical Robotics in 2021 IEEE International Conference on Robotics and Automation
4-Jun-21	Dr. CAI Mingjing (Supervisor: Prof. LIAO Wei-Hsin)	Ph.D., MAE Faculty Member	Faculty Outstanding Thesis Award 2020, CUHK
5-Jun-21	Prof. CHEN Benmei	Faculty Member	Dean's Exemplary Teaching Awards 2020, CUHK
12-Jun-21	Prof. ZI Yunlong	Faculty Member	Fellow of International Association of Advanced Materials (FIAAM)
15-Jun-21	Mr. LI Haoang	Ph.D., MAE	Department Excellent Tutor Award 2019-20, CUHK; Faculty Outstanding Tutor Award 2020, CUHK
26-Jun-21	Dr. DING Zhe (Supervisor: Prof. LIAO Wei-Hsin)	Research Staff Faculty Member	Best Oral Presentation, Hong Kong Scholars Annual Symposium 2021

Dean's Exemplary Teaching Awards 2020

Department Excellent Tutor Award 2019-2020

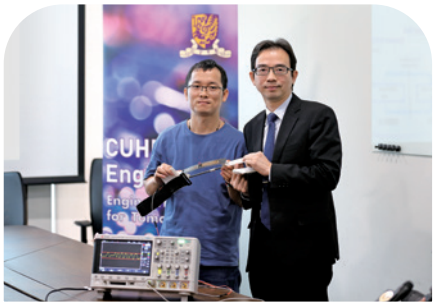
Best Oral Presentation, HK Scholars Annual Symposium

RESEARCH ACHIEVEMENTS

30 October 2019

Harvest Energy from Human Knee

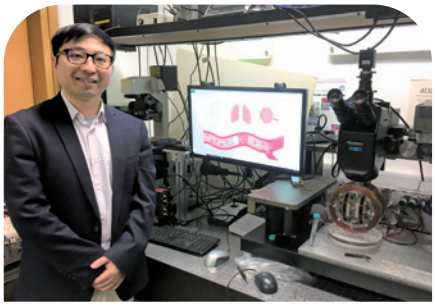
A research team led by Prof. LIAO Wei-Hsin has developed a lightweight smart materials-based energy harvester for scavenging energy from human motion, generating inexhaustible and sustainable power supply just from walking. Specifically, the device can capture biomechanical energy from the motion of the human knee and then convert it to electricity which can be used to power wearable electronics such as pedometers, health monitors, and GPS. This work has been published in *Applied Physics Letters* and recommended as a featured article by editors.



10 February 2020

Translating Basic Science Research to Clinical Application

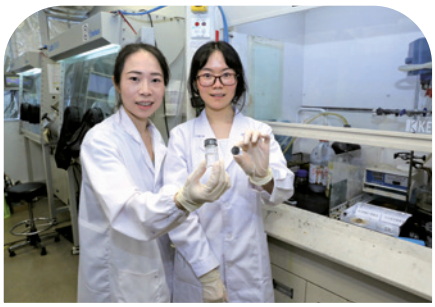
A strategy that selects the optimised bio-inspired microrobotic swarms in different bio-fluids was developed by Prof. ZHANG Li and his research team. The swarms reported may lead to high possibilities in medical applications, and this work is a significant intermediate step from a fundamental understanding of microrobotic swarms to their clinic applications. *Nature Communications*, a distinguished international scientific journal, has published the related results.



14 May 2020

Breakthrough in Battery Research: Electrolyte Made with Skin Cream Ingredients Enables Stable and Non-flammable Aqueous Li-ion Batteries

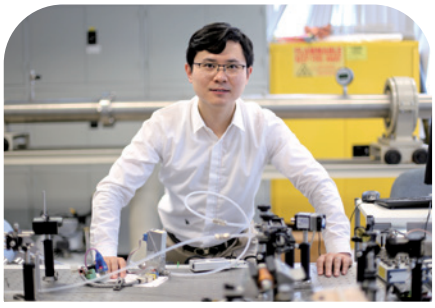
A research team led by Prof. LU Yi-Chun has taken a critical step forward in improving high-energy batteries by introducing a novel electrolyte to the aqueous Lithium-ion (Li-ion) battery. This electrolyte is commonly used in skin cream. It is inexpensive, non-flammable, less toxic and is eco-friendly, yet can create stable voltage for common usage. The breakthrough was published in *Nature Materials*, a world-leading scientific journal.



25 May 2020

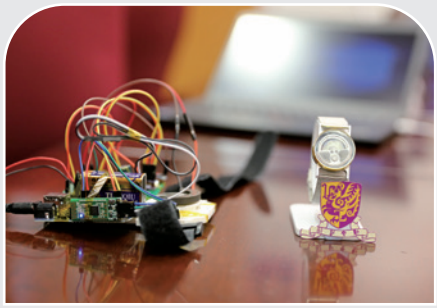
Revealing the Role of Water Vapour in Methanol Atmospheric Reaction

A research team led by Prof. REN Wei has adopted high-level quantum chemistry calculations to provide a definitive answer to the role of water vapour in some important atmospheric reactions. The new findings will enable a more accurate and reliable prediction of air pollution and atmospheric chemistry. The research work has been reported in the renowned scientific journal, *Angewandte Chemie-International Edition* and was highlighted as the Very Important Paper (VIP).



2 November 2020

Battery Life of Smart Watches and Wristbands Breakthrough



A research team led by Prof. LIAO Wei-Hsin has developed an embedded energy harvester which is very efficient in generating electricity to sustainably power the smart watches and wristbands. The research team has proposed a highly compact embedded generator, equipped with a motion capture unit, a magnetic frequency-up converter and a power generation unit, together with coaxial topology. Thanks to the magnetic frequency-up converter, the energy harvester is highly compact and has a very high normalised power density. Although the total volume of the harvester is 5cm^3, it can still achieve 1.74mW power output. The power density is ten times that of the existing devices. Benefiting from high power output and power density, the energy harvesting system can be easily embedded in the smart watches and wristbands to provide sustainable power supply.

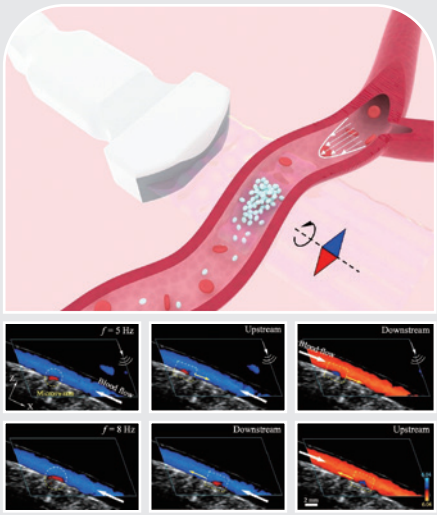
19 March 2021

Leading Blue Energy Revolution: Water-Tube-Based Triboelectric Nanogenerator for Efficient Ocean Wave Energy Harvesting

A research team led by Prof. ZI Yunlong has recently developed a water-tube-based triboelectric nanogenerator that can efficiently convert various irregular and low-frequency mechanical energies, including ocean wave energy, into electricity, providing a new avenue for the development of "Blue Energy". They encapsulated water in a Finger-Sized Tube. When water moves in the tube between regions of the two electrodes, triboelectrification happens and electric currents can be generated. Taking advantage of the flexibility of water, the WT-TENG can be operated in various modes, including rotation, swing, seesaw, and horizontal linear modes, to harvest energy from diverse mechanical movements in the environment, such as ocean waves, wind, body and vehicle movements.

31 March 2021

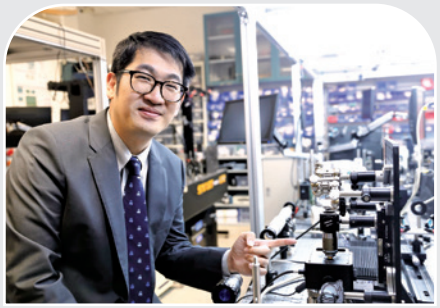
Navigation and Localization of Microrobotic Swarms in Blood Vessels



A research team led by Professor ZHANG Li has developed a new strategy to simultaneously control and track a microrobotic swarm in blood vessels in real-time. Driven by a rotating permanent magnet, a magnetic microswarm was formed and navigated near the boundary of vessels, where the reduced drag of blood flow and strong interactions between nanoparticles enable upstream and downstream navigation in flowing blood. The rotating microswarm affects the motion of blood cells and disrupts normal blood flow, enabling Doppler imaging and real-time tracking from multiple viewing configurations. The dynamic Doppler feedback and the fast response of the magnetic control approach benefit the targeted navigation in different flowing conditions (i.e. stagnant, flowing blood, and pulsatile flow).

April 2021
Nanoscale Printer Breakthrough

The printer, developed Prof. CHEN Shih-Chi, creates a metamaterial surface that can manipulate light, rejecting it if desired. The new printer is a record breaker in three ways. It sets a new high-water mark for printing speed, resolution and cost. The technique is known as FP-TPL, full name Femtosecond Projection Two-Photon Lithography. Femtosecond lasers are a family of pulse laser that do not emit continuous light, with a high peak power but very low average power use. Compared to existing nanoscale printers, Professor Chen's invention cuts the cost of production by 98%, improves throughput anywhere from 1,000 to 10,000 times, and allows for a resolution of 140 by 175 nanometres.

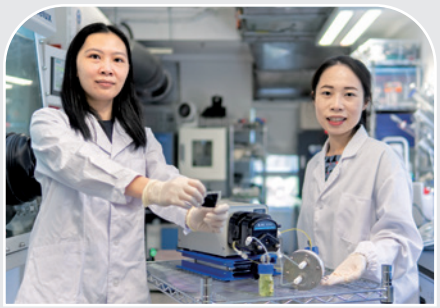


8 April 2021
Biohybrid Soft Microrobots with a Rapid Endolumnial Delivery Strategy for Gastrointestinal (GI) Diseases

A collaborative research team led by Professor ZHANG Li, Professor Joseph SUNG Jao-Yiu and Professor Philip CHIU Wai-Yan from the Faculty of Medicine has developed biohybrid soft microrobots with an Endoscopy-Assisted Magnetic Navigation Strategy for rapid endoluminal delivery. This work provides a new enabling technology for medical microrobot-based minimally invasive intervention and has the potential for treating various diseases in tiny and tortuous lumens which are hard-to-reach or inaccessible by regular medical devices.

4 May 2021
Develop New Technology Extending the Lifetime of Redox Flow Batteries and the Development of Grid-Scale Energy Storage

A research team led by Professor LU Yi-Chun, has successfully developed a novel Charge-Reinforced Ion-Selective (CRIS) membrane for sulphur-based redox flow batteries, with 15 consecutive hours of runtime and over 2,000 hours cycling without obvious capacity decay. The new battery has taken a significant step forward in the practical application of redox flow batteries in grid-scale storage for renewable energy, and in its commercialisation, by resolving the problems posed by its poor lifetime and low cost-effectiveness. The breakthrough has been recently published in the world-leading scientific journal *Nature Energy*.



DEPARTMENT NEWS

2019-2020 Academic Year
New Faculty Members join the MAE Department

Prof. SONG Xu and Prof. ZHANG Weizhao have joined the MAE Department as Assistant Professors.

Prof. SONG Xu

Prof. ZHANG Weizhao

29 July 2019
Visit of IET and IEEE Members to CUHK T-Stone Robotics Institute

The members of Institution of Engineering and Technology Hong Kong (IET) and Institute of Electrical and Electronics Engineers (IEEE) had a technical visit to CUHK T-Stone Robotics Institute.

21 September 2019
The MAE Department 25th Anniversary Dinner

Reference: https://www4.mae.cuhk.edu.hk/newsnawards/mae-25th-anniversary-dinner/

The year of 2019 marks the 25th Anniversary of the establishment of the MAE Department in CUHK. Honourable guests and alumni joined our Homecoming Anniversary Dinner to celebrate this special occasion with us.

8 October 2019
Celebration Dinner with the CUHK Robocon Team

Celebrating the accomplishments and success of the CUHK Robocon Team in the ABU Asia-Pacific Robot Contest 2019 in Mongolia. The Team was crowned Champion!

16 October 2019
EEEN Career Talk Series

In collaboration with the Energy Institute, professionals from facilities management, financial and sustainability consulting industries gave a career talk to our Energy and Environmental Engineering Programme students.

2020-2021 Academic Year
New Faculty Members join the MAE Department

Three faculty members have joined the MAE Department: Prof. CHEN Fei and Prof. WONG Hay as Assistant Professors; and Prof. Juan ROJAS as Research Assistant Professor.

Prof. CHEN Fei

Prof. Juan ROJAS

Prof. WONG Hay

20 November 2020
Press Conference with Innovation and Technology Commissioner

Prof. LIAO Wei-Hsin represented the local universities to present the project 'Wearable Exoskeleton for Motion Assistance' with a live demo, as the kick-off of Inno Carnival 2020.

18 December 2020
Fellow of The Academy of Engineering Singapore

Reference: https://www4.mae.cuhk.edu.hk/newsnawards/the-academy-of-engineering-singapore/

Prof. Ben CHEN was elected as Fellow of the Academy of Engineering, Singapore (SAEng).

22 March 2021
MAE Vlog Competition

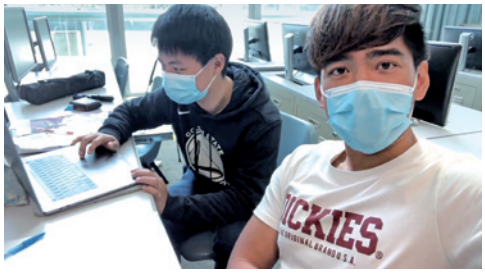
The result of the 1st MAE Vlog Competition was released. The 4 winning students created vlogs to talk about MAEG and EEEN programme experience and their campus life.

Watch here!

MAEG 1st Prize – CHAN Sheung Yan

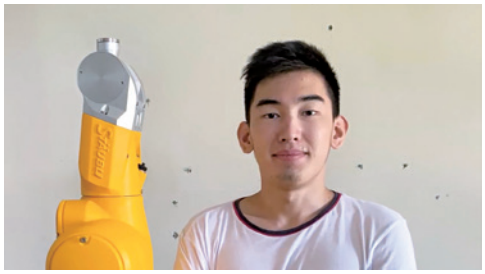
Watch here!

EEEN 1st Prize – YEUNG Sze Hang



Watch here!

MAEG 2nd Prize – LAI Kai Chun and KEI Hoi Pang



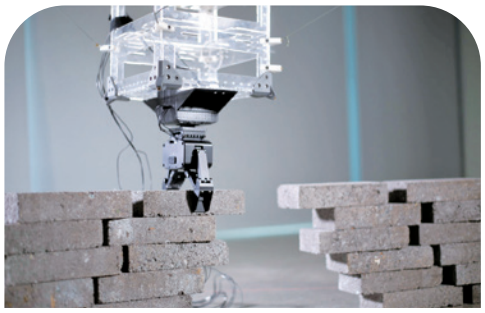
Watch here!

MAEG 2nd Prize – TURTAYEV Yerlan

April 2021

CU-Brick Exhibits in the Hong Kong Science Museum

Prof. Darwin LAU has developed the brick structure construction system named "CU-Brick". In collaboration with Prof. Adam FINGRUT, Assistant Professor from the School of Architecture, "CU-Brick" serves as an alternative type of robotically controlled on-site bricking which turns innovative designs into executed complex brick placement operations. The "CU-Brick" system has been demonstrated at different locations, such as CUHK, Hysan Place and the Science Museum in Hong Kong, and even in Shenzhen and Beijing. The system's portability and setup convenience open up a range of possibilities in larger scale artistic displays and attract public attention to construction robotics.

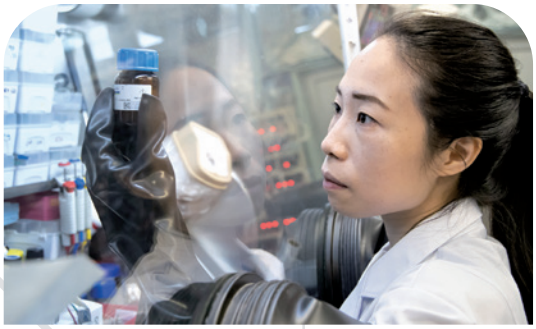


Watch here!

26 April 2021

Fellow of the Royal Society of Chemistry

Prof. LU Yi-Chun was elected as Fellow of the Royal Society of Chemistry (RSC) in April 2021. The RSC is the oldest chemistry society and one of the most influential societies in the world.



9 April 2021

EEEN Photo Day

The EEEN Society decorated booths for the class of 2021 of the EEEN undergraduates to celebrate their first step before graduation. The Department and the society gave the graduates-to-be the best wishes for their next adventure.

28 May 2021

MAEG Photo Day

The MAEG Society decorated booths for the class of 2021 of the MAEG undergraduates to celebrate their first step before graduation. With the non-alcohol champagne and party poopers, the Department and the society gave the graduates-to-be the best wishes for their next adventure.

STUDENT SHARING

ALUMNI SHARING

POON Nap Ching
(UG, MAEG 2021)

Attending the IC training was one of the most memorable experience in my university life. This training offered an interactive and hands-on learning opportunity to us. I really enjoyed it. Another great experience was that I worked at the Electrical and Mechanical Services Department, HKSAR Government for 8 weeks as a summer intern. Through this intern experience, I was able to put the theories and knowledge I learned from the MAEG course into practice. What is more, these experiences made me realize that even though the MAEG programme may seem to be emphasizing on theories a lot, it provides students a sound mechanical engineering foundation which enables us to build mechanics easily.

CHAN Sheung Yan
(UG, MAEG 2021-2022)

I obtained hands-on experience from MAEG courses which I enjoyed a lot. During these courses, I could apply my knowledge into building cars and robots. I think students who are interested in this programme, enjoy building things. The MAEG programme provides the exact opportunity to us to learn and make all sort of machineries. In the future, I hope I can find a job that is related to 3D Printing.

WONG Chun Keung
(UG, EEEN 2021)

Although half of my university life is online learning, I think I enjoyed my university life a lot. I met many life-long friends, and got an opportunity to work in CLP Power Hong Kong Limited for a year in which I gained a lot of working experience. I will explore different job opportunities within the engineering sector, hopefully I can work overseas to broaden my horizons.

WONG Kin Sum
(UG, EEEN 2021)

The most memorable experience in CUHK was being the President of the EEEN Student Society. Running the society, I met a lot of friends and understood different students' expectations on the programme. We also got chances to advocate for environmental issues. After graduation, I hope to find energy and environmental engineering related jobs.

WORK STUDY PROGRAMME SHARING

The Work Study Prgoramme is held in the summer every year. It combines course work and industrial training, and narrows the gap between academic learning and practical training. One year before the students' final year of study, students can participate in the Work Study Programme on a voluntary basis. They are required to spend about 1 year as a full-time employee in a selected local company. Students will resume to study when the Work Study Programme is finished.

Name WONG Chun Keung
Major B.Eng in EEEN
Study Year Year 4
Company CLP Power Hong Kong Limited
Job Title Intern – Sandwich

I joined the sandwich internship programme in 2019 at CLP Power Hong Kong Limited. I was glad to join this programme because it provided opportunities to me to take part in many projects which is launched by CLP. The 1-year internship period gave me a valuable opportunity to work in a reputable company before graduation.

Working in CLP as an intern taught me the fundamental knowledge of renewable energy programme and electricity market both in Hong Kong and in China. I collected the electricity price data from China and learnt that the electricity market reform is changing rapidly in China. On the other hand, I monitored the application status and procedures for the renewable energy programme in Hong Kong. Through this programme, I was able to study different kinds of solar panels, types of transformers and power calculation that can be applied in many houses in Hong Kong.

I believed that it offered me immense advantages to be part of the Energy and Environmental Engineering field in the future.

Name SO Ming Wai
Major B.Eng in MAEG
Study Year Year 4
Company The Hong Kong and China Gas Company Limited (Towngas)
Job Title Industrial Trainee

Throughout the Work Study Programme, I have polished my soft and hard skills. For example, I learnt new technical skills such as gas connection, in which I gained valuable hands-on experiences in operating live gas connection. I learnt the operation of Automatic Meter Reading too.

I initiated to develop a training record input system and generate training record reports with Excel Marco VBA and Microsoft Access to reduce manpower and input errors. The process of building everything from scratch is very rewarding.

Not only did I put the knowledge I learnt from the MAEG programme into practice, but also gain hands-on working skills that can only be obtained from a workplace.

Name WONG Kai Yuen
Major B.Eng in MAEG
Study Year Year 4
Company Hong Kong Observatory
Job Title Student Intern

Through the Work Study Programme provided by the MAE Department, I applied for the 1-year placement programme in the Hong Kong Observatory (HKO) and was assigned to the Radiation Monitoring and Assessment Branch. I have never thought of working in HKO because it is a prestigious organization. As a student intern, although I could not issue warnings on weather related hazards, HKO equipped me with meteorological knowledge and comprehensive knowledge in radiation background in Hong Kong. Engineering is very important and very much related to the HKO even though the work of HKO seems to be related to Science more. Afterall, all apparatus in HKO is made by engineers, and that's why we have a strong relationship with scientists.

As a MAE student who specializes in robotics, working at the HKO for a year made me realize my strength and discover that there are many opportunities for us to perform ourselves, that Mechanical and Automation Engineering is not just about making robots. I am sure that students who are interested in engineering will have great success in the future. Work hard and stay strong!

Name CHAN San Yu
Major B.Eng in MAEG
Study Year Year 2
Company Hong Kong Observatory
Job Title Student Intern

I joined a 1-year placement programme in Hong Kong Observatory (HKO). In my internship, I assisted in the outreach educational activities, for example, I taught college students knowledge about Arduino assembling, and how to measure radiation and other meteorological data. Apart from this, I was also involved in webpage design.

I was inspired by HKO team's work ethics. The pursuit of precision and accuracy extended from weather forecast to publicity. To ensure all the content was accurate, we had to do a lot of testing before publishing to the website.

Working in HKO helped bridge the gap between theories and practices. I learned about Nuclear Energy from EEEN programme, while HKO provided Nuclear Energy case studies to me to learn, for example nuclear accident protocol and Daya Bay Contingency Plan.

The most memorable part of my internship was the educational outreach. I got the chance to visit secondary schools to teach and build connections with the students. We assembled a weather detection kit that recorded temperature, humidity, atmospheric pressure and radiation. These activities offered us a great opportunity to treasure the nature.

EXCHANGE PROGRAMME SHARING

Interested students can join the Exchange Programme during their second or third year at CUHK. The Exchange Programme generally lasts either a term, a summer or an academic year. There are over 280 destinations which students can select from, including Asia, Australia, Europe, The United States and Africa.

Name	CHAN Longinus
Major	B.Eng in MAEG
Study Year	Year 4
Exchange Location	Sweden, Uppsala
University Name	Uppsala University

I applied for an exchange programme to study at Uppsala University in Sweden because I wanted to strengthen my skills and learn more about data structure. I spent five months in Uppsala University where I studied courses of Energy Physics, Computer Programming and Basic Swedish.

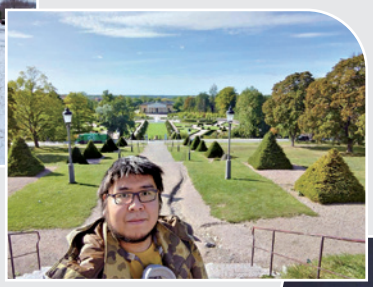
Uppsala University adopted a teaching method called 'Flipped Classroom'. Unlike traditional pedagogy which teachers teach different topics in classes, the Flipped Classroom requires students to learn new topics at home and bring questions back to classes to discuss with classmates. I enjoyed this new teaching method because it suited me best.

I met friends from Sweden, Finland, Greece and Laos. We exchanged ideas and cooked food together. I can cook different cuisine now, like Paella, Jansson's Frestelse and Glögg. I learned Swedish simple phrases too, so I could read and make conversation in Swedish. One of the most interesting things to me was Fika which means coffee meeting. Similar to the tea time in Hong Kong, Fika was a short break during work hour which employees would take everyday at work.

I love travelling. Studying in Sweden allowed me to travel to different cities in Sweden, such as Kiruna, Linköping, Malmö and Stockholm. I saw the northern lights in Kiruna, that is the most unforgettable moment in my life.

I am very grateful that I had this exchange opportunity. Without MAE Department's support, I would not have had this fruitful time in Sweden. Tack så mycket (Thank you so much)!

Arlanda International Airport. Thanks to this exchange programme, I had the chance to see Boeing 747 at a close distance and learn the technical and mechanical details of the Queen of the Sky.



The Linnaean Gardens of Uppsala

The Northern Lights in Kiruna

STATISTICS

GRANTS

Over HK$52 million of grant funding was applied and received successfully by faculty members of MAE Department from 2019-2021. The grants commenced in the above period include funding from Research Grant Council (RGC) and Innovation and Technology Fund (ITF) from the Innovation and Technology Commission of the HKSAR Government.

RGC GRANTS

PRINCIPAL INVESTIGATOR	PROJECT TITLE
Prof. AU Kwok Wai	Agile Legged Locomotion Based on External Appendage and Null Space Avoidance Control Framework
Prof. AU Kwok Wai	Safe and Effective Robotic Debridement and Drilling with Adjustable Force Sensing Anchoring System and Hierarchical Virtual Fixture Control for Confined Space Bone Work
Prof. CHEN Benmei	Intelligent Navigation and Robust Flight Control Systems for Unmanned Systems
Prof. CHEN Chun	Enhancing the Performance of Electrospun Nanofiber Filters by Structure Optimization and Their Application in Buildings for Effective Indoor $PM_{2.5}$ Control
Prof. CHEN Shih-Chi	High Throughput Nano-Patterning Based on Temporal Focusing and Laser Induced Periodic Surface Structuring
Prof. CHENG Shing Shin	A Novel Continuum Manipulator for Transoral Robotic Surgery
Prof. HUANG Jie	A Framework for the Cooperative Output Regulation of Multi-Agent Systems by Sampled-Data Distributed Control and its Applications
Prof. HUANG Jie	Adaptive Distributed Observer for Uncertain Leader Systems and its Applications
Prof. LAU Darwin Tat Ming	Analysis and Configuration Design of Continuously Reconfiguring Cable-Driven Parallel Robots
Prof. LIAO Wei-Hsin	Intelligent System and Control of Wearable Exoskeleton for Motion Assistance
Prof. LIAO Wei-Hsin	Computing Tool-Paths for Strengthening Parts Fabricated by Filament-Based Multi-Axis 3D Printing
Prof. LIU Yunhui	Modeling and Vision-Based Control of a Robot Manipulator Climbing a Rope
Prof. LIU Yunhui	Control of a Robot Manipulator on a Floating Base Hung from Top of a High-Rise Building by Ropes
Prof. LU Yi-Chun	Electrode-Electrolyte Design and Degradation Mechanism of Potassium-Oxygen Batteries: Reaction Kinetics, Product Morphology and Cell Reversibility
Prof. LU Yi-Chun	Developing Low-Cost, Eco-Friendly and High-Voltage Aqueous Electrolytes for High-Energy and Sustainable Aqueous Batteries Applications
Prof. REN Wei	A Novel Optical Gas Sensor with All-Fiber Dual-Comb Spectroscopy
Prof. XU Dongyan	Enhancing Flow Boiling Heat Transfer in Microchannels by Surface Engineering
Prof. XU Yunjian	Stochastic Deadline Scheduling for Large-Scale Electric Vehicle Charging with Renewable Generation and Energy Storage
Prof. YUAN Haidong	Cooperation Between Coherent Controls and Noises in Quantum Metrology
Prof. YUAN Haidong	Control-Enhanced Quantum Hypothesis Testing
Prof. ZHANG Li	3D Printing of Miniature Robots for Minimally Invasive Ophthalmological Treatment
Prof. ZI Yunlong	Boosting Dynamic Performance of the Triboelectric Nanogenerator
Prof. ZI Yunlong	Multi-Scale Studies of the In-Situ Discharge Behaviors in Triboelectric Nanogenerators

ITF GRANTS

PRINCIPAL INVESTIGATOR	PROJECT TITLE
Prof. CHEN Shih-Chi	Ultrafast 3-D Nano-Structuring of Functional Materials Based on Femtosecond Light Sheets
Prof. CHENG Shing Shin	Development of an Ultrasound-Guided Robotic Steerable Catheter for Pericardiocentesis
Prof. CHENG Shing Shin	An MRI-Compatible Robotic Cannula for Intracerebral Hemorrhage Evacuation
Prof. CHENG Shing Shin	A Flexible Endoscope for the Robot-Assisted Bimanual Functional Endoscopic Sinus Surgery
Prof. CHENG Shing Shin	Development of a Novel Gastric Simulator for Endoscopic Skill Training and Evaluation
Prof. LAU Darwin Tat Ming	BORE Robot System for Automated Deep Underground Large Diameter Bored Pile Operations for Improved Building Foundation Works
Prof. LIAO Wei-Hsin	Self-Powered Smart Prosthetic Knee
Prof. LU Yi-Chun	A Safe, Scalable and Low-Cost Energy Storage System for Smart City and Micro-Grid Applications
Prof. REN Wei	Development of a Battery-Powered Handheld Formaldehyde Sensor for Ultrasensitive Indoor Air Monitoring
Prof. REN Wei	Intelligent Sensing System for Boiler Energy Saving and Pollutant Emission Monitoring
Prof. ZHANG Li	Development of a Magnetically Enhanced TPA Accumulation (META) System to Enhance Endovascular Treatment for Elderly Patients with Acute Ischemic Stroke
Prof. ZHANG Li	Development of QuickCAS: An Easy-to-Use Analysis System for Quick Detection of C. Diff Toxin in Patients Stool
Prof. ZHANG Weizhao	Optimization for Preforming of Carbon Fiber Reinforced Plastic (CFRP) Parts Based on Numerical Modeling

SCHOLARSHIPS

In the academic years of 2019-2020 and 2020-2021, 191 scholarships with an estimation of over HK$4 million were awarded to students of the MAE Department. The scholarships were awarded from the HKSAR Government, industrial sponsors and the University.

The following tables show scholarships that were awarded by the HKSAR Government and industrial sponsors.

HK GOVERNMENT (2019-2021)

STUDENT NAME	PROGRAMME	SCHOLARSHIP NAME
SAUNG Hnin Phyu	UG, EEEN	Belt and Road Scholarship (Myanmar)
CHOI Jeongho	UG, MAEG	HKSAR Government Scholarship
CHOW Sing Tak	UG, MAEG	HKSAR Government Scholarship
LIU Kangcheng	Ph.D., MAE	Hong Kong PhD Fellowship Scheme
OUYANG Wenqi	Ph.D., MAE	Hong Kong PhD Fellowship Scheme
YAO Fengju	Ph.D., MAE	Hong Kong PhD Fellowship Scheme
CHAN Hugo Hung-Tin	Ph.D., MAE	Hong Kong PhD Fellowship Scheme
HE Xiongnan	Ph.D., MAE	Hong Kong PhD Fellowship Scheme
LIU Wai Shing	Ph.D., MAE	Hong Kong PhD Fellowship Scheme
HUANG Wenjie	Ph.D., MAE	Hong Kong PhD Fellowship Scheme
DARSTANIFARAHANI Mohammadhossein	Ph.D., MAE	Hong Kong PhD Fellowship Scheme

INDUSTRIAL SPONSORS (2019-2020)

STUDENT NAME	PROGRAMME	SCHOLARSHIP NAME
CHENG Jianlong	UG, EEEN	Pro-Technic Scholarship
HO Ka Chun	UG, EEEN	CLP Scholarship in Energy and Environmental Engineering
HO Ka Chun	UG, EEEN	Pro-Technic Scholarship
WANG Yujiao	UG, EEEN	Dahua Education Scholarship
AU Tsz Him Vincent	UG, MAEG	CLP Scholarship in Mechanical and Automation Engineering
LAU Hoi Yin	UG, MAEG	Polywell Scholarship
LEUNG Chi Hang Hans	UG, MAEG	NTK Scholarship
SHARMA Pulkit	UG, MAEG	Polywell Scholarship
WONG Fei Yan Fiat	UG, MAEG	Hongkong Maker Association Scholarship

INDUSTRIAL SPONSORS (2020-2021)

STUDENT NAME	PROGRAMME	SCHOLARSHIP NAME
CHAN Yip Ming	UG, EEEN	Hongkong Zhuhai Commerce Association Scholarship
YEUNG Sze Hang	UG, EEEN	CLP Scholarship in Energy and Environmental Engineering
AU YEUNG Siu Lun	UG, MAEG	Hongkong Zhuhai Commerce Association Scholarship
BAEKOVA Alina	UG, MAEG	Hongkong Maker Association Scholarship
CHAN Po Wah	UG, MAEG	CLP Scholarship in Mechanical and Automation Engineering
GARG Shiven	UG, MAEG	Dahua Education Scholarship
WANG Wenhao	UG, MAEG	NTK Scholarship

DEPARTMENT MEMBERS

ACADEMIC STAFF

FACUTLY MEMBERS

Prof. AU Kwok Wai Samuel	Associate Professor
Prof. CHEN Benmei	Professor Vice-Chairman (Graduate)
Prof. CHEN Chun	Assistant Professor
Prof. CHEN Fei	Assistant Professor
Prof. CHEN Shih-Chi	Professor
Prof. CHEN Yongsheng (till August 25, 2021)	Associate Professor
Prof. CHEN Yue	Assistant Professor
Prof. CHENG Shing Shin	Assistant Professor
Dr. HAN Dongkun	Lecturer
Prof. HUANG Jie	Choh-Ming Li Research Professor of Mechancial and Automation Engineeirng
Prof. Juan ROJAS	Research Assistant Professor
Prof. LAU Darwin Tat Ming	Associate Professor
Dr. LI Yiyang	Senior Lecturer
Prof. LIAO Wei-Hsin	Choh-Ming Li Professor of Mechanical and Automation Engineering Department Chairman Director of Institute of Intelligent Design and Manufacturing
Prof. LIU Yunhui	Choh-Ming Li Professor of Mechancial and Automation Engineeirng Director of CUHK T Stone Robotics Institution (CURI) Director of Hong Kong Centre for Logistics Robotics
Prof. LU Yi-Chun	Associate Professor MSc Programme Director
Prof. REN Wei	Associate Professor
Prof. SONG Xu	Assistant Professor
Prof. WANG Zerui (till October 1, 2019)	Research Assistant Professor
Prof. WANG Changling Charlie (till July 24, 2020)	Professor
Prof. WONG Hay	Assistant Professor
Prof. XU Dongyan	Associate Professor EEEN Programme Director
Prof. XU Yangsheng	Professor of Automation and Computer-Aided Engineering
Prof. XU Yunjian	Assistant Professor
Prof. YAM Yeung	Research Professor Director of CUHK Shenzhen Research Institute (SZRI)
Prof. YUAN Haidong	Associate Professor
Prof. ZHANG Li	Professor
Prof. ZHANG Weizhao	Assistant Professor
Prof. ZI Yunlong	Assistant Professor

PROFESSORS (BY COURTESY)

Prof. ZHAO Ni	Professor (by courtesy)

ADJUNCT PROFESSORS/ADJUNCT ASSISTANT PROFESSORS

Prof. CHUNG Chi-Kit Ronald	Adjunct Professor
Prof. GUO Ping	Adjunct Assistant Professor
Prof. HUI Kin Chuen	Adjunct Professor
Prof. KWONG Chung Ping	Adjunct Professor
Prof. LAM Hiu Fung Alan	Adjunct Professor
Prof. WANG Changling Charlie	Adjunct Professor
Prof. WONG Ching Ping	Adjunct Professor

SUPPORTING STAFF

COMPUTING STAFF

Mr. LAU Chun Hung Thomas	Assistant Computer Officer
Miss CHAN Yuk Kuen (till September 30, 2020)	Computer Technician
Mr. LEUNG Kin Wing Rave	Computer Technician
Ms. DJIN Kie Karina	Computer Technician

ENGINEERING STAFF

Mr. MOK Wai Kit Allan	Electronic Officer
Mr. CHEUK Chi Ming	Technician
Dr. LAI Lai Fan Asta	Technician
Mr. LEE Yuk Keung Philip	Technician
Mr. LEUNG Yun Yee Martin	Senior Technician
Dr. TONG Hang	Technician
Mr. YU Siu Ning	Technician

ADMINISTRATIVE STAFF

Ms. KAN Yuet Lin	Executive Assistant
Miss AU Ho Ling June	Project Coordinator
Ms. MOK Siu Ping Connie	Project Coordinator
Miss WONG Tsoi Ning Meg (till August 20, 2021)	Project Coordinator
Ms. CHAN Miu Ling Maggie	General Clerk
Miss FUNG Ka Yin Kay	General Clerk
Miss WONG Fung Kuen Winnie	General Clerk
Ms. WONG Mei Ha Joyce	General Clerk
Mr. CHEW Chi Kin Paul	Office Assistant

SCHOLARSHIP DONOR COMPANIES (IN ALPHABETICAL ORDER) (2019-2021)

CLP Power Hong Kong Limited
Dahua Education
Hongkong Maker Association
Hongkong Zhuhai Commerce Association
NTK Holdings Limited
Polywell Machinery Limited
Pro-Technic Machinery Limited

ADVISORY COMMITTEE (2019-2021)

CHAIRMAN

Mr. CHAN Siu Hung, JP	Managing Director - China CLP Holdings Limited

MEMBERS

Ir. CHANG Che Son	Chairman and Director Key Direction Limited
Ms. CHIANG Maria L. L.	Managing Director Chen Chien Holdings Limited
Mr. CHU Weiman (2019-20)	Managing Director Leeport Tools Limited
Mr. IP Simon P. S.	Director NTK Holdings Limited
Mr. LAI Robert K. T.	Managing Director Pro-Technic Machinery Limited
Ir. Dr. LAM Alan Hiu Fung	CEO Sengital Limited
Ir. Dr. LEE Barry C. H.	Director ATAL Engineering Limited
Dr. LEUNG Raymond S. H.	Chairman; Chairman & CEP FiMax Technology Limited; Altai Technologies Limited
Mr. LIU Chi Hung Kevin	General Manager (Metal Business Unit) CN Innovations Limited
Mr. WONG Yam Mo	Chief Technical Officer ASM Pacific Technology Limited
Prof. XIE Lihua	Professor School of Electrical and Electronic Engineering, Nanyang Technological University

EX-OFFICIO MEMBERS

Prof. WONG Martin D. F.	Dean Faculty of Engineering, CUHK
Prof. LIAO Wei-Hsin	Chairman Department of Mechanical and Automation Engineering, CUHK
Prof. LU Yi-Chun	M.Sc. Programme Director Department of Mechanical and Automation Engineering, CUHK

SECRETARY

Prof. AU Kwok Wai Samuel	Chairman, Industrial Relationship Committee Department of Mechanical and Automation Engineering, CUHK

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