



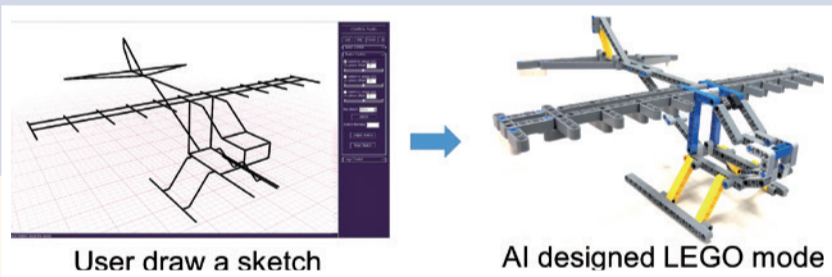
AI RESEARCH

The Faculty is committed to fostering the advancement of innovative technologies to benefit society. With strong support from the university, the Faculty has built up an inter-disciplinary research team since its inception in 1991. After two decades of development, we have developed core competencies in various engineering disciplines.

DSE
 Computer Science
 and Engineering

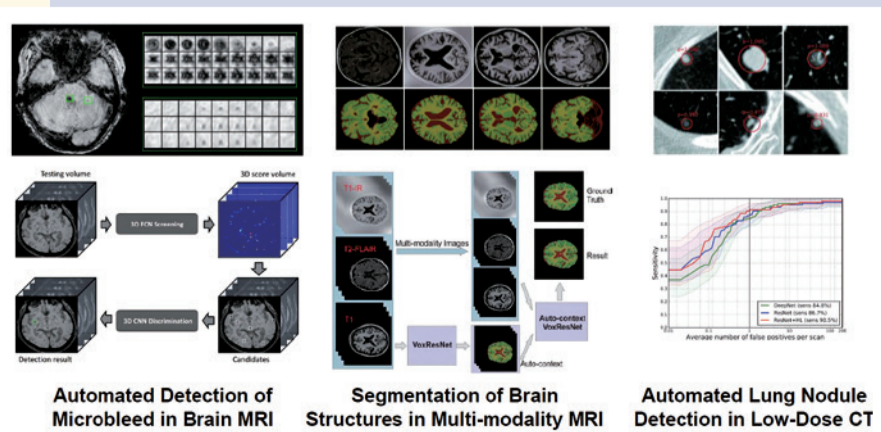
Computational LEGO Technic Design

We developed an AI programme to automatically design LEGO Technic models. Even for professional designers, the LEGO Technic design process usually requires several weeks or even months of trial and error. With our AI programme, users now just need to draw a sketch, then our programme can automatically design a beautiful and stable LEGO Technic model that resembles the sketch in less than one minute. Moreover, the programme will also generate the assembly instruction to assist users in the assembly. We invited several volunteers to draw sketches and our programme generated the LEGO Technic models for them (see picture). This project will be submitted to SIGGRAPH 2019 and also demonstrated in HK SciFest 2019.



AI System for Computer-aided Diagnosis

A research team led by Prof. Heng Pheng Ann, Department of Computer Science and Engineering, has developed an automated image processing technology using AI that is able to offer efficient and accurate diagnosis using CT scan and histopathological images. The technology has been tested on two of Hong Kong's most prevalent cancers – lung cancer and breast cancer—achieving diagnostic accuracies of 91% and 99% respectively. The tests, which take between 30 seconds to 10 minutes, demonstrate that the technology not only boosts efficiency in clinical diagnosis, but also reduces misdiagnosis. The automated screening and analysis technology is expected to be widely adopted by the local medical sector in the next couple of years.



SEEM

Systems Engineering
 and Engineering Management

Automatic Recognition of Disordered Speech

Speech disorders such as dysarthria are commonly found among the elderly population, hindering their verbal communication with the outside world. Speech disorders not only introduce a negative impact on their quality of life but also increase the cost of care. As Hong Kong is ageing rapidly, the number of people with speech disorders will further increase. Due to the great mismatch between normal and disordered speech, state-of-the-art speech recognition systems designed for normal speech often produce very low recognition accuracy when applied to disordered speech.

Hence, there is a pressing need to develop new technologies that perform disordered speech recognition with high accuracy. Recent research conducted at the Faculty and department led to a highly accurate automatic speech recognition system that produced the best performance on disordered speech published to date. The CUHK research team is currently developing more advanced AI technologies to further enhance the performance of such systems, and allow them to be more widely usable for multiple languages including Cantonese, English and Putonghua.

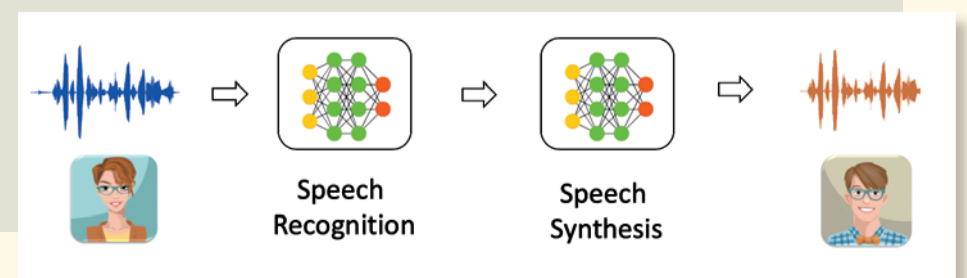
This research will allow easier and more fluent dialogue between Cantonese speakers with such disorders, in Hong Kong and the Greater Bay Area, and the outside world. It also forms a strong basis for future research on disordered speech recognition for Putonghua and other Chinese dialects to help a much larger number of similarly afflicted people in China.

FEATHER

	DURABLE	EMILIO	ENDOWMENTS	WATCH	PLANE	SWIMMING	WATCHES
CUHK system Accuracy: 72.7%	✓	✗	✗	✓	✗	✗	✗
Google API Accuracy: 48.6%	✗	✗	✗	✓	✗	✗	✗
Human Accuracy: 42.2%	✗	✗	✗	✓	✗	✗	✗

Voice Conversion

Voice Conversion (VC) is a technique aiming at transforming one person's speech such that it sounds as if it were spoken by another person. The Human-Computer Communications Lab (HCCL) of CUHK recently proposed the Phonetic Posteriorgrams (PPGs)-based VC technique, which received the only Best Paper Award of ICMI 2016 and has since then been adopted by other research groups in the VC community. The proposed VC system first recognises what the source speaker said using automatic speech recognition to transform the speech into a speaker-and-language-independent representation known as "Phonetic Posteriorgram". Through speech synthesis this representation is then outputted as the 'speech' of the target speaker. The Automatic Speech Recogniser and the Speech Synthesiser are trained separately by deep learning approaches using a large amount of speech data from the target speaker and many other speakers.





Electronic Engineering

Visual Question Answering

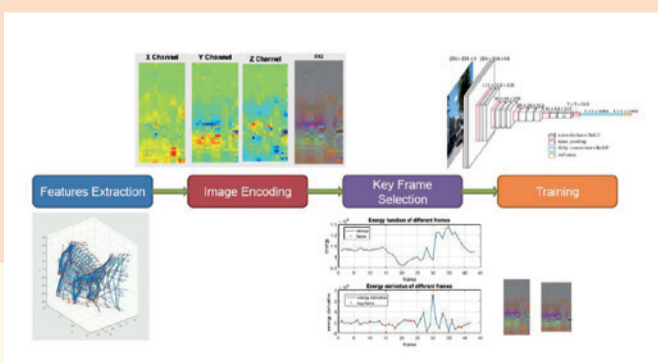
Prof. Li Hongsheng's group has recently developed an AI program that can answer questions related to an input image. Such a challenging task is called Visual Question Answering (VQA). The AI program is required to understand and reason the contents of the image as well as the question to predict the correct answer. The developed AI program detects objects in the input image and infers the relationships between them. The cross-modal relations between objects in the image and words in the question are also automatically modeled by the AI program. The answers can be correctly predicted based on the cross-modal reasoning. The proposed AI program currently ranks 1st in the public VQA benchmark VQA 2.0.



Mechanical and Automation Engineering

Considering the Motion Speed and Orientation in 3D Human Action Recognition Using Two-stream CNN

Prof. LIU Yunhui's group recently published paper about the 3D action recognition problem. Based on human skeleton data, the skeletal kinematics features are calculated first, i.e., linear velocity and orientation displacement, to capture the action variation along time. Then a novel image encoding method is introduced to encode the proposed kinematics features into images. Key frame selection scheme is also proposed to guarantee the same image input size. When training the CNN, the popular two-stream CNN architecture is adopted, incorporating spatial and temporal networks. The spatial ConvNet is trained on still RGB images, while the temporal ConvNet is trained on the proposed encoded kinematics features. This method is evaluated on a challenging multi-view dataset and the experiment results show that the proposed method is fast to train and outperforms many handcrafted features. (Published as conference paper "Kinematics Features for 3D Action Recognition Using Two-Stream CNN" on WCICA 2018)



Information Engineering

Intelligent Vision Systems

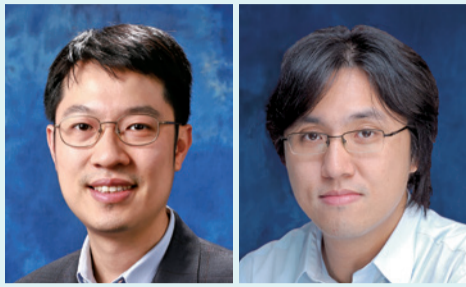
Leading by Prof. LIN Dahua, the current AI research in the Multimedia Lab has three main themes. Firstly, by applying the technology of machine learning and deep learning, we aim to build an intelligent system that is able to extract useful information from our daily videos (bottom figure). For example, our system can automatically recognize the persons, objects as well as the mood and actions in videos. Secondly, our research endeavor also lies at the interaction of images and languages (top right). Human intelligence has a remarkable ability of using languages to describe the visual world; we would like to equip machines with a similar capacity. Lastly, we teach creativity and aesthetics to computers (top left). Our newly developed AI agent is able to create its own oil paintings.



A Robot for Baby-caring: Detecting the Dangerous Behaviors Conducted by Young Children in Daily Life

Prof. LIU Yunhui's group recently developed a child caring robot, for detecting some dangerous behavior performed by child in the domestic environment based on the human action recognition and object recognition technologies. A human behavior is an interactive process between human and objects. Therefore, three factors need to be considered: the engaged objects, human actions and the relationship between human and the engaged objects. For the human action recognition, a new motion encoding is introduced and a convolutional neural network is utilized. Evaluation on the Northwester-UCLA dataset verified the effectiveness of this method when action categories are small. The proposed action recognition method is simple and efficient, which is crucial for online behavior detection. Extensive experiments in the real physical world for detecting the behavior of eating allergic fruit and touching/playing electrical socket have achieved good performance. (Published as Conference paper "A child caring robot for the dangerous behavior detection based on the object recognition and human action recognition" on IEEE INTERNATIONAL CONFERENCE ON ROBOTICS AND BIOMIMETICS (ROBIO) 2018)





Prof. Anthony So Prof. Wing-kin Ma

IEEE Signal Processing Best Paper Award

Professor Anthony Man-Cho So (Department of Systems Engineering and Engineering Management) and Professor Wing-Kin Ma (Department of Electronic Engineering) jointly received the 2018 IEEE Signal Processing Best Paper Award for their paper titled "Outage constrained robust transmit optimization for multiuser MISO downlinks: Tractable approximations by conic optimization," published in IEEE Transactions on Signal Processing in 2014. This award is among the most prestigious paper awards in IEEE Signal Processing Society.

IE Students Win the Championship in Classified Post Hackathon 2018

A team of three undergraduate IE students, Wong Kin Fai, Tam Kin Pak and Kwan Tsz Kit, won in the Classified Post Hackathon 2018. The competition was a 24-hour challenge to students and fresh graduates, to build winning digital solutions for large corporations. The winning team employed techniques of machine learning in creating a Career GPS Programme.



IE Student Wins the Bronze Award of the ASM Technology Competition

Mr. NG Ka Lok, 2018 MIE graduate and current IE MPhil student, won the Bronze Award of the ASM Technology Competition with his project entitled "A Secure Deep Neural Network framework with Trusted Processor and GPU". The project was supervised by Prof. Sherman S. M. CHOW.

Dr. Qi DOU Wins the HKIS-TOWNGAS Young Scientist Award 2018

The HKIS-TOWNGAS Young Scientist Award is to honour young scientists and engineers in Hong Kong who show great promise in their field of study, with the hope that this will nurture the growth of science and technology in the region. This year, a total of 67 applicants participated in the field of Engineering Science, which made this candidate pool very competitive. Dr. Qi DOU won this award by presenting her fruitful research in artificial intelligence for medical image computing.



BME Students Win in EMedic Global 2018



Mr. Heung Ho Lam, Tang Zhiqiang, Ho Chun Man and Tung Lok Him from the Department of Biomedical Engineering won the Silver Award for Overall Achievement and Technical Challenge Award in Engineering Medical Innovation Global Competition (EMedic Global 2018), which was organised by Chow Yuk Ho Technology Centre for Innovative Medicine, CUHK (Department of Biomedical Engineering is also one of the co-organisers).

The team is led by Professor Raymond Tong from Department of Biomedical Engineering and Professor LI Zheng from Department of Surgery. The team has developed a 3D-print soft robotic hand that provide stroke patients more comfortable daily assistance for their rehabilitation process.

CUHK Team Receives Gold Medal in iGEM 2018

Miss CHAN Nga Yan and Mr. PANG Cheuk Him, undergraduate Yr. 4 and Yr. 3 students from the Department of Biomedical, received a gold medal as members of the CUHK school team at the International Genetically Engineered Machine (iGEM) 2018 Giant Jamboree held in Boston, USA, for developing a rapid, on-site and relatively low price system of influenza diagnosis. The winning project has extensive potential applications and may help fight the growing threat of influenza A.



Project link: http://2018.igem.org/Team:Hong_Kong-CUHK

Welcome Our New Dean of Engineering

Professor Martin D.F. Wong was appointed as dean of the Faculty of Engineering with effect from 4 January 2019, serving for a term of five years. Professor Wong was also appointed as Choh-Ming Li Professor of Computer Science and Engineering.



Professor Wong obtained his BSc degree in Mathematics from the University of Toronto in 1979, and received his Master's degree in Mathematics (1981) and PhD in Computer Science (1987) from the University of Illinois at Urbana-Champaign (UIUC). He is currently the Edward C. Jordan Professor of Electrical and Computer Engineering and the Executive Associate Dean of the College of Engineering at UIUC. Professor Wong is a world-renowned scholar in the area of Electronic Design Automation (EDA). A prolific author, he has published more than 450 refereed articles in top journals and at conferences. Professor Wong has graduated 50 PhD students, many of whom now hold leadership positions in industry and academia. His research interests include EDA, combinatorial optimization, graph algorithms, parallel processing, cloud computing and machine learning. He is a Fellow of the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronic Engineers (IEEE) in recognition of his contributions to the algorithmic aspects of EDA, and has won a number of prestigious awards from both organizations. He also received the Distinguished Alumni Educator Award in Computer Science at UIUC.

Two Engineering Professors Elected IEEE Fellows 2019

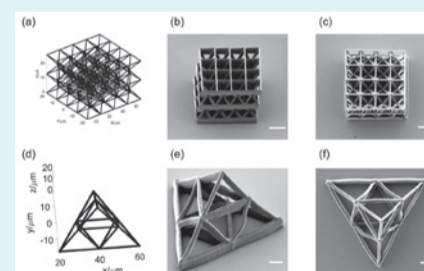
Prof. Tsang Hon Ki and Prof. Irwin King Kuo Chin, have been elected Fellows of the Institute of Electrical and Electronics Engineers (IEEE) in the class of 2019, for their research contributions to "nonlinear silicon photonics and advanced waveguide grating couplers" and the "theory and applications of machine learning in social computing".



Prof. Tsang Hon Ki Prof. Irwin King

Prof. Tsang Hon Ki is currently the Associate Dean (Research) of the Faculty of Engineering and Professor of the Department of Electronic Engineering. He is well known for his research contributions to nonlinear silicon photonics and advanced waveguide grating couplers. He joined the development of the first silicon photonic integrated circuits for commercial telecommunication networks and was among the handful of early researchers to work in the nascent field of silicon photonics in the 1990s. Since then, the research community in silicon photonics has grown tremendously. Silicon photonics has become one of the mainstream technologies for high-speed energy-efficient communications used in data centres and is a key technology enabling data centres to support the continued growth of data traffic in the internet. Silicon photonics chips are also finding new applications in light detection and ranging (LIDAR) for autonomous cars, gas sensors, artificial neural networks (artificial intelligence hardware), secure quantum communications and quantum computing.

Prof. Irwin King Kuo Chin is currently the Associate Dean (Education) of the Faculty of Engineering and Professor of the Department of Computer Science and Engineering at CUHK. Prof. King has been dedicated to research in machine learning, social computing, web intelligence, data mining, and multimedia information processing. Prof. King owns six international patents, including the VeriGuide System. It is plagiarism detection software which detects similar sentences and performs readability analysis of text-based documents in both English and in Chinese to promote academic integrity and honesty. In recent years, he has actively promoted e-learning and Massive Open Online Courses (MOOCs). With funding support from the University Grants Committee, he launched an eLearning platform KEEP (Knowledge & Education Exchange Platform), developed and initiated by CUHK with all partner institutions, as a project investigator.



MAE Professor Receives the 2018 R&D 100 Award

Prof. Shih-Chi Chen, Department of Mechanical and Automation Engineering and his team have been honoured with the 2018 R&D 100 Award – "The Oscar of Invention" for the development of the Digital Holography-based 3-D Nano-Builder. It can additively write micro-nano-scale components with complex structures in high speed and is especially suitable for applications in research and development such as printing photonic, robotic, metamaterials, micro-scaffolds, and drug delivery devices.



3-D printing technology has generated profound impact on the engineering world and is often considered the technology that drives the third industrial revolution. It covers a broad range of applications such as aviation, medicine, science and technology, and entertainment. 3-D printing has opened new possibilities for various industries by enabling faster and easier prototyping and manufacturing processes, but there are still a number of limitations in speed, resolution and flexibility.

The Nano-Builder employs a revolutionary random-access scanning method that allows tens of laser foci to simultaneously write structures at 22.7 kHz. Compared with the existing point-scanning-based systems and solutions, the Nano-Builder presents distinctive advantages in precisely controlling the focus position, and each focal point can be independently controlled to follow any planned trajectory in space, which increases the throughput and reinforces the structure dramatically.

FinTech Seminar Series by CUHK Centre for Financial Engineering



Picture of Seminar by Dr. MeiKei Leong of ASTRI on "IoT and Blockchain"

CUHK is at the forefront of providing FinTech education at the Bachelor and Master degrees level and has received very positive comments from the community. We are actively working to expand the collaboration between the University and the financial and technology industry, and more importantly to increase the awareness of the potential implications of FinTech acceleration expected in the coming year.

On this basis, we have been holding the CUHK FinTech Seminar Series ("Seminar Series") monthly, where industry practitioners are invited to our campus to share their areas of expertise. The objectives are multi-fold, namely:

- To bring together experts from academia and industry
- To provide a platform to carry out fruitful and productive discussions
- To encourage the exchange of ideas
- To promote opportunities for future collaboration

The topics are quite comprehensive, covering many areas, including corporate restructuring, blockchain, risk management, smart banking, virtual banking, start up incubation, cyber security, innovative solutions... The speakers are senior executives at prestigious institutions who are expected to bring forth real, practical, and insightful enlightenment to our faculty and students. Below is a tentative schedule of the upcoming seminars.

	Time	Topics	Speakers
1	Dec 6, 2018	Transformation @ Microsoft	Ms. Joelle Woo, Senior Director, Microsoft Greater China
2	Jan 10, 2019	IoT Blockchain	Dr. MeiKei Leong, Chief Technology Officer, ASTRI
3	Feb 21, 2019	Use of Technology in Managing Operational Risks in a Global Financial Organization	Mr. Raymond Cheng, Chief Operating Officer, Asia Pacific HSBC
4	Mar	A Review of the HKMA Smart Banking Initiatives	Mr. Nelson Chow, Chief Fintech Facilitation Officer, HKMA
5	Apr	Virtual Banking – An Incumbent Bank's Perspective	Mr. Peter Clark, Regional CIO Standard Chartered Bank
6	May	IBM Annual 5 in 5	Mr. Samson Tai, Chief Technology Officer, IBM
7	Jun	Inhouse Fintech Incubator – StartupXchange	Mr. Matthew Ng, Senior Vice President, DBS HK & Mainland China
8	Jul	IoT & Cyber Security	Mr. Garrick Ng, Chief Technology Officer, CISCO
9	Aug	Commercializing Open API	Mr. Cliff Chan, Head of Commercial Banking IT, Hang Seng Bank
10	Sep	New Tools for a New World	Mr. Dean Samuels, Head of Solutions Architecture, Amazon Web Services
11	Oct	Enabling Fintech@Intel	Mr. Otto Chow, Solution Architect Manager, Intel Technologies

HKEIA Innovation & Technology Project Competition Award

The Final-Year Project of Ng Si loi (EE graduate of 2018 and current EE PhD student) won the Gold Prize in the 2018 HKEIA Innovation & Technology Project Competition Award organized by the Hong Kong Electronic Industries Association. The project title is "Detection and Screening of Cantonese Child Speech Sound Disorder Using Automatic Speech Recognition Techniques". Ng Si loi also won the 1st Prize in ICT Category and Innovation Award of the 2018 Challenge Cup (Hong Kong).



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INNOVATION AND TECHNOLOGY STUDENT CLUB



With a view to prepare Hong Kong for new challenges, the Faculty of Engineering, The Chinese University of Hong Kong (CUHK) set up an "Innovation and Technology Student Club" (ITSC) jointly with Innovation and Technology Commission (ITC). Our vision is to nurture young talent to become the future technology elite who will contribute to the development of Hong Kong. Since May 2009, we have recruited almost 2,000 secondary students with interests in science and engineering.

InnoCarnival 2018 in Hong Kong Science Park

From 3 to 11 November 2018, ITSC set up a booth at InnoCarnival 2018 organised by ITC, HKSAR in Hong Kong Science Park. With a theme of "Arduino" this year, we created a game "Arduino 考思路" which was unique and attractive to the public. The players needed to select the right pipelines to reach the big prize destination. An Arduino experience corner was also set up for students to learn how to make Arduino work.



Our game field and the Arduino experience corner

Professor WONG Kam-fai (left 4) with ITSC members as ambassadors together with our staff members and helpers

2018 ITSC Winter Camp in CUHK & Wu Kai Sha Youth Village with theme "AI (Artificial Intelligence)"

From 27 to 29 December 2018, a 3D2N camp was organised for 30 ITSC members in Wu Kai Sha Youth Village and CUHK. This year, our theme was the current trending topic: "AI". Our purpose is for participants to learn how AI works, and understand its many potential contributions to society. Details of the programme are as follows:

- Day 1: Theme Talk; 6-hour AI Workshop (students were taught how to train a robot car automatically run by AI technology)
- Day 2: Maglev Pneumatic Car Workshop, Commercial Sharing of AI by SenseTime (AI unicorn), Academic Sharing of AI by Professor Wong Kam-fai, CUHK, Welcome 2019 New Year Party, campfire BBQ
- Day 3: CU Hunt, Competition themed "How to make a better world with AI technologies?"



AI Workshop by Mr. Sam Yu, tutor of Smart Kiddo Education

A participant learning how to use AI to programme the car with autopilot function along the 'white paper' route

Competition champion group with their prizes presented by Professor WONG Kam-fai



Commercial Sharing by SenseTime – AI unicorn

More and more STEM activities are coming up during the Easter and summer holidays like exchange camp, summer camp, DNA workshop, technology visits such as DJI, CITAC, Toyota and etc. they will surely surprise and delight you...

Still waiting Act now and apply for ITSC membership and also "Like" us in facebook to receive ITSC first-hand news.

ITSC is planning various activities like technology reporter, research internship, technology ambassador, summer camp, workshops in coming March and summer. You may view more of our activities on our Facebook page and YouTube channel as below: www.itsc.org.hk, www.facebook.com/ITSC.HK and www.youtube.com/CUHKcintec.

If you are a secondary student, you are welcome to join our activities by online application for ITSC membership through www.itsc.org.hk/chi/membership.html. By joining our membership programme, you'll find most activities are free of charge.