WFC
Workshop on Future Computing
2020

日　　期　Dec.14 – 15
地　　點　國立成功大學 勝利校區 未來館3F(舊K館)
主 辦 單 位　敏求智慧運算學院

國立成功大學 National Cheng Kung University

敏求智慧運算學院 Miin Wu School of Computing

CONTENT

THEME

The continuous advances in computing are reshaping the entire education system, and eventually all disciplines and industries worldwide, under the rapid development in machine learning algorithms, AI and neuromorphic computing, quantum computing, etc.

Workshop on Future Computing invites experts and leaders from academia, industry, and the public sector to share, elaborate, and discuss critical issues, developments, breakthroughs and new perspectives in future computing, including theories, methodologies, architectures, systems, applications, social implications, etc. The annual WFC is organized by Miin Wu School of Computing(SOC), NCKU, and the 1st WFC was held last year and very well received by attendees.

Topics of the workshop this year include Computing Architecture, high-performance & memory-centric computing, AI Robotics, Computational Biomedicine, AI-Assisted Healthcare, AI and Intelligent Mobility, Splendid AI Applications, and visions on future computing.

ORGANIZING COMMITTEE

Honorary General Chair	Huey-Jen Jenny Su (蘇慧貞) President, NCKU
Honorary General Co-Chair	Miin Wu (吳敏求) Chairman and CEO, MXIC
General Chair	Cheng-Wen Wu (吳誠文) Executive Vice President, NCKU
Program Chair	Ming-Der Shieh (謝明得) Dean, Miin Wu School of Computing, NCKU
Program Co-Chair	Wei-Fen Lin (林偉棻) Professor, Miin Wu School of Computing, NCKU
Local Arrangements Chair	Kuen-Jong Lee (李昆忠) Professor, Dept. of Electrical Engineering, NCKU
Local Arrangements Co-Chair	Joy Chia-Yi Lin (林佳怡) Research Associate Professor, Headquarters of University Advancement, NCKU
Publicity Chair	Ray-Bing Chen (陳瑞彬) Professor, Dept. of Statistics, NCKU
Publicity Co-Chair	Shao-Man Lee (李韶曼) Assistant Professor, Miin Wu School of Computing, NCKU
Publications Chair	Jenn-Jier James Lien (連震杰) Professor, Minn Wu School of Computing, NCKU
Workshop Secretary	Zih-Han Lin (林子涵) Project Manager, Miin Wu School of Computing, NCKU

DAY1 PROGRAM

December 14 (Monday)

Time	Session	Speakers	Session Format	Chair	Location
08:30-09:00	Opening	Huey-Jen Jenny Su (蘇慧貞) President, NCKU Miin Wu (吳敏求), Chairman and CEO, MXIC Lih J. Chen (陳力俊), Chancellor, University System of Taiwan Ming-Der Shieh (謝明得) Program Chair & Dean, Miin Wu School of Computing, NCKU	Welcome addresses (3-4 minutes) Distinguished Guest address (3-4 minutes) Distinguished Guest address (3-4 minutes) Program highlights (5-8 minutes)	Cheng-Wen Wu(吳誠文), General Chair & Executive Vice President, NCKU	3F, NCKU Future Venue
09:00-09:50	Keynote Speech 1: Computing and Architecture	Steve Reinhardt Partner Hardware Engineering Manager, Microsoft	**Cloud-Scale Inference on FPGAs at Microsoft Bing** Speech/Presentation (40m talk and 10m Q&A)	Cheng-Wen Wu(吳誠文), General Chair & Executive Vice President, NCKU	3F, NCKU Future Venue
09:50-10:10	Break		Group Photoshoot		2F, NCKU Future Venue
10:10-11:50	Session I: Future Computing	Tzi Cker Chiueh (闕志克), Vice President and General Director, Information and Communications Research Laboratories, ITRI Peter Wu (吳漢章), CEO, ASUS Cloud Corporation CK Tseng (曾志光), President, Arm Taiwan Ltd. Hsien-Hsin Sean Lee (李憲信), Research Head, FAIR SysML, Facebook Boston Shou-De Lin (林守德), Chief Machine Learning Scientist, Appier Inc. Wei-Fen Lin (林偉棻), Professor, Miin Wu School of Computing, NCKU	Presentation/ Panel Discussion 1. Each distinguished speaker has 10 minutes (with no more than 10 slides) to address his vision on future computing, and justify the vision by evidence and clues if possible. (60 minutes) 2. After all presentations, the speakers will then take questions and comments from the audience and discuss with them. (40 minutes)	Yen-Kuang Chen (陳彥光), Vice President, Technical Activities, Circuits and Systems Society, IEEE	3F, NCKU Future Venue

DAY1 PROGRAM

December 14 (Monday)

Time	Session	Speakers	Session Format	Chair	Location
11:50-13:10	Lunch				2F, NCKU Future Venue
13:10-14:00	Keynote Speech II: AI Robotics	Takeo Kanade (金出武雄), U.A. and Helen Whitaker University Professor, Carnegie Mellon University	**Real World AI** Speech/Presentation (40m talk and 10m Q&A)	Jyuo-Min Shyu(徐爵民) Emeritus Professor, Dept. of Computer Science, NTHU	3F, NCKU Future Venue
14:00-15:40	Session II: AI Robotics	Jenn-Jier James Lien (連震杰), Professor, Miin Wu School of Computing, NCKU Yang-Ting Shen (沈揚庭), Associate Professor, Dept. of Architecture, NCKU Winston Hsu (徐宏民),Professor, Dept. of Computer Science and Information Engineering, NTU Ying Nian Wu (吳英年), Professor, Dept. of Statistics, UCLA Chih-Hung Li (李志鴻), Associate Professor, Institute of Manufacturing Tzuu-Hseng S. Li (李祖聖), Distinguished Professor, Dept. of Electrical Engineering, NCKU	Presentation/ Panel Discussion 1.Each distinguished speaker has 10 minutes (with no more than 10 slides) to show his **vision and/or exciting work on AI robotics**, stressing **technological, economic, and societal impact.** (60 minutes) 2.After all presentations, the speakers will then take questions and comments from the audience and discuss with them. (40 minutes	Ren Luo (羅仁權), Irving T.Ho Chair and Distinguished Professor, Dept. of Electrical Engineering, NTU	3F, NCKU Future Venue
15:40-16:00	Break				2F, NCKU Future Venue

DAY1 PROGRAM

December 14 (Monday)

Time	Session	Speakers	Session Format	Chair	Location
16:00-17:40	Session III: Computational Biomedicine	Jiaxin Yu (游家鑫), Director, AI Innovation Lab, CMUH Weichung Wang (王偉仲), Professor, Institute of Applied Mathematical Sciences, NTU Tsang-Wei Tu (涂倉維), Assistant Professor, Dept. of Radiology, Howard University Shih-Chieh Lin (林士傑), Professor, Institute of Neuroscience, NYMU Henry Horng-Shing Lu (盧鴻興), Professor, Institute of Statistics, NCTU Yi-Shan Tsai (蔡依珊), Director, Clinical Innovation and Research Center, NCKU Hospital	1.Each distinguished speaker has 10 minutes (with no more than 10 slides) to address the **trends and challenges of massive datasets and machine learning/ artificial intelligence for computational biomedicine.** (60 minutes) 2.After all presentations, the speakers will then take questions and comments from the audience and discuss with them. (40 minutes)	Chun-houh Chen (陳君厚), Director, Institute of Statistical Science, Academia Sinica	3F, NCKU Future Venue
18:00-20:00	Banquet				38F, Shanghai Pavilion, Shangri-La' s Far Eastern Plaza Hotel, Tainan

DAY2 PROGRAM

December 15 (Tuesday)

Time	Session	Speakers	Session Format	Chair	Location
08:50-09:40	Keynote Speech III: Venture Capital and AI Innovation	Peter Hsieh (謝弘輝), VP, Innovation & Investment, Strategy, Arm Taiwan Ltd.	**Future Computing Innovation and Sustainable Development** Speech/Presentation (40m talk and 10m Q&A)	Burn J. Lin (林本堅), Distinguished Research Chair Professor, Dept. of Electrical Engineering, NTHU	3F, NCKU Future Venue
09:40-10:00	Break				2F, NCKU Future Venue
10:00-11:40	Session IV: AI and Intelligent Mobility	Ching-Yao Chan (詹景堯), Director, Berkeley DeepDrive, UC Berkeley Yi-Ting Chen (陳奕廷), Assistant Professor, Dept. of Computer Science, NCTU Michael Li (李夏新), Division Director, Division for Connected & Autonomous Vehicle System, ITRI Steven Lin (林群翔), NXP Taiwan Country Manager, NXP Semiconductor Chieh-Chih (Bob) Wang (王傑智), Chief Digital Officer, MMSL, ITRI Jyh-Ching Juang (莊智清), Professor, Dept. of Electrical Engineering, NCKU	Presentation/ Panel Discussion 1. Each distinguished speaker has 10 minutes (with no more than 10 slides) **to address how AI is impacting mobility and to share best practices or insights.** (60 minutes) 2. After all presentations, the speakers will then take questions and comments from the audience and discuss with them. (40 minutes)	Yu-Chee Tseng (曾煜棋), Professor, College of Artificial Intelligence, NCTU	3F, NCKU Future Venue
11:40-13:10	Lunch & SOC Address	Ming-Der Shieh (謝明得), Program Chair & Dean, Miin Wu School of Computing, NCKU		Cheng-Wen Wu (吳誠文), General Chair & Executive Vice President, NCKU	2F, NCKU Future Venue

DAY2 PROGRAM

December 15 (Tuesday)

Time	Session	Speakers	Session Format	Chair	Location
13:10-14:50	Session V: Splendid AI Applications	Jerry Chou (周志遠), Professor, Dept. of Computer Science, NTHU Shih-Wei Liao (廖世偉), Associate Professor, Dept. of Computer Science and Information Engineering, NTU Li-C. Wang (王立中), Professor, Dept. of Electrical and Computer Engineering, UCSB Chia-Liang Kao (高嘉良), CEO, InfuseAI Yu Tsao (曹昱), Deputy Director, Research Center for Information Technology Innovation, Academia Sinica Shao-Man Lee (李韶曼), Assistant Professor, Miin Wu School of Computing, NCKU	Presentation/ Panel Discussion 1. Each distinguished speaker has 10 minutes (with no more than 10 slides) to **demonstrate the most splendid AI application** that he has been involved in, stressing **technology insights and contributions.** (60 minutes) 2. After all presentations, the speakers will then take questions and comments from the audience and discuss with them. (40 minutes)	Yi-Wen Liu (劉奕汶), Distinguished Professor, Department of Electrical Engineering, NTHU	3F, NCKU Future Venue
14:50-15:10	Break				2F, NCKU Future Venue
15:10-16:50	Session VI: Memory-Centric Computing	Keh-Chung Wang (王克中), Chief Scientist, Emerging System Lab., Macronix Chia-Lin Yang (楊佳玲), Professor, Dept. of Computer Science and Information Engineering, NTU Todd Lin (林功藝), Chief Technology Officer, Egis Technology Inc. Edward Wei (魏士鈞), Senior Adviser, Realtek Semiconductor Corp. Meng-Fan Chang (張孟凡), Distinguished Professor, Dept. of Electrical Engineering, NTHU Darsen Lu (盧達生), Assistant Professor, Dept. of Electrical Engineering, NCKU	Presentation/ Panel Discussion 1. Each distinguished speaker has 10 minutes (with no more than 10 slides) to show his/her most significant work related to **in-memory computing, stressing insights and contributions in all aspects.** (60 minutes) 2. After all presentations, the speakers will then take questions and comments from the audience and discuss with them. (40 min)	Tei-Wei Kuo (郭大維), Professor, Dept. of Computer Science, City University of Hong Kong and NTU.	3F, NCKU Future Venue
16:50-18:10	Farewell Party				2F, NCKU Future Venue

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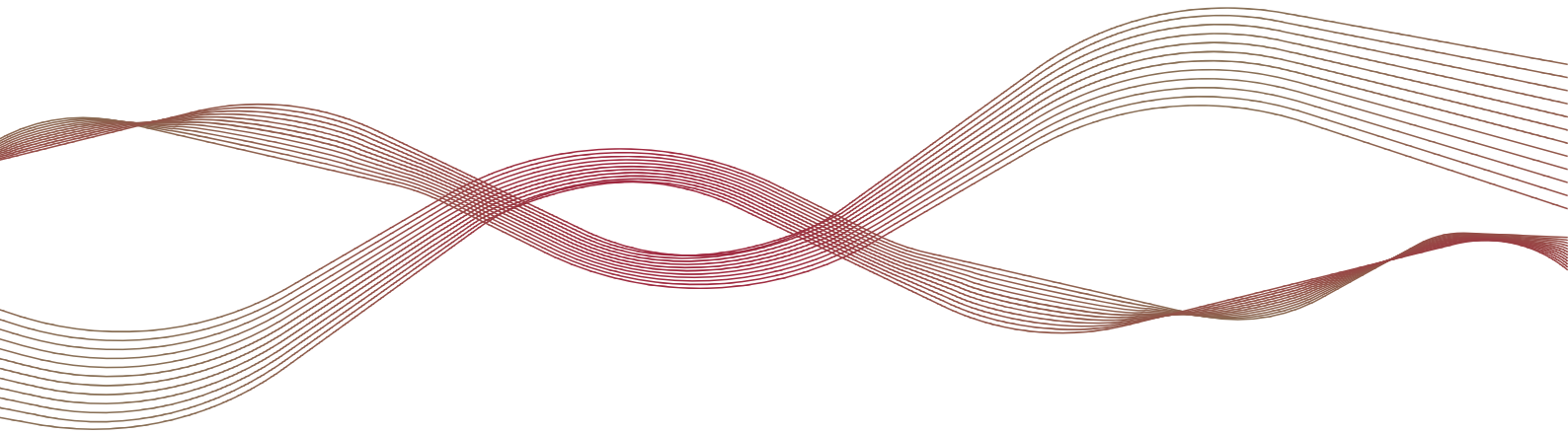
Opening



Honorary General Chair

Huey-Jen Jenny Su 蘇慧貞

President, NCKU

Dr. Huey-Jen Jenny Su is currently a Distinguished Professor of Environmental Health at the National Cheng Kung University (NCKU) in Taiwan. Her research efforts have primarily focused on the topic of air pollution related health effects, with a particular emphasis on the rising global concerns with airborne microbial hazards. She was also an expert member of the committee that prepared the World Health Organization' s report concerning guidelines for biological agents in the indoor environment. In 2015, Dr. Su became the first female President in the history of NCKU. She was honored by her alma mater with the Harvard T. H. Chan School of Public Health' s 2017 Leadership Award in Public Health Practice, which recognizes a graduate who has been an outstanding example of effective leadership in the practice of public health. Moreover, Dr. Su was cited for her outstanding leadership among the top 100 award-winning researchers, academics, and innovators, and leaders in the 2018 edition of the Asian Scientist Magazine. She also received the 2017 Outstanding Research Award from the Ministry of Science and Technology in Taiwan. She was cited one of the 10 "Science Stars of East Asia" for her indoor air pollution by leading journal Nature.

Honorary General Co-Chair

Miin Wu 吳敏求

Chairman and CEO, MXIC

Dr. Miin Wu founded Macronix International Co., Ltd. In 1989. Macronix is Taiwan' s first memory manufacturer which is dedicated to developing top-notch home-grown products and technologies. It is one of a very few Taiwanese Integrated Device Manufacturer (IDM) companies which can design, manufacture, and sell its own IC products. Under Wu' s visionary leadership, Macronix has become a leading world-class non-volatile memory company.

During the emerging stage of semiconductor industry in Taiwan, Dr. Wu brought many of his fellow Taiwanese engineers working in the United Sates back to homeland to found Macronix. This "Reverse Brain Drain" move tuned back the situation of most Taiwanese high-tech talents migrating to foreign countries in search of education and training but never to return. In addition, he assisted in promoting high-tech companies as the investment target in Taiwan stock market to appeal more foreign investments. In 1995, Macronix became the first high-tech company listed in Taiwan Stock Exchange Corporation. This has further facilitated foreign investors increasing their investment ratio in Taiwan.

Dr. Wu has earned many recognitions and awards such as "Top Executive"(Electronic Business Asia), "The 25 Industry executives who made a difference" (Electronic Buyers' News), Cover People of Forbes, "Outstanding Contribution Award" (The Electronics Devices and Materials Association), "The Stars of Asia" (Business Week), "Honorary Doctorate" of National Chiao Tung University, National Cheng Kung University, and National Tsing Hua University, a Fellow and "Outstanding Performance Award in the Field of Management of Technology" of Chinese Society for Management of Technology, Social Education Contribution Awards of Ministry of Education, and "Country Winner" and "Business Paradigm Entrepreneur" of EY Entrepreneur Of The Year.

General Chair

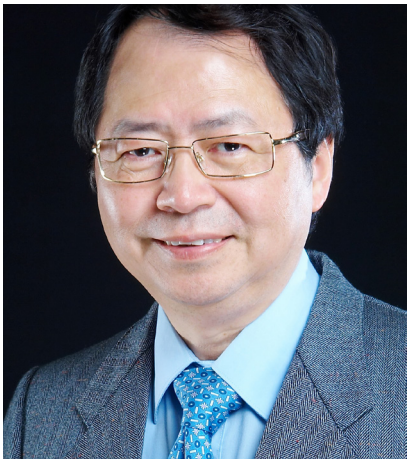
Cheng-Wen Wu 吳誠文

Executive Vice President, NCKU

Dr. Cheng-Wen Wu received the BSEE degree from NTU in 1981, and the MS and PhD in ECE from UCSB in 1985 and 1987, respectively. He is currently an EVP of National Cheng Kung University and Senior Vice President of ITRI. Since 1988, he has been with the Department of EE, National Tsing Hua University (NTHU), Hsinchu, Taiwan, where he is currently a Tsing Hua Distinguished Chair Professor. He has served in the past at NTHU as the Director of Computer Center, Chair of EE Department, Director of IC Design Technology Center, Dean of the College of EECS, and Senior Vice President for Research. When he was on leave from NTHU, 2007 to 2014, he served at ITRI as the General Director of the SOC Technology Center, and the Vice President and General Director of the Information and Communications Labs.

Dr. Wu received the Distinguished Teaching Awards (twice) from NTHU, the Outstanding Electrical Engineering Professor Award from the Chinese Institute of Electrical Engineers (CIEE), the Distinguished Research Awards (three times) from National Science Council, the Industrial Collaboration Awards (twice) from the Ministry of Education (MOE), the Academic Award from the Ministry of Education (MOE), the National Endowed Chair Professorship from MOE, the EE Medal (highest honor) from CIEE, etc. His current research interests include test and repair of semiconductor memories, and design and test of symbiotic/neuromorphic IOT devices and systems. He is a life member of the CIEE, a life member of Taiwan IC Design Society, a Fellow of the ROC Technology Management Society, and a Fellow of the IEEE.

Distinguished Guest



Lih J. Chen 陳力俊

Chancellor, University System of Taiwan

Lih J. Chen is the Chancellor of the University System of Taiwan and Distinguished Research Chair Professor at the Department of Materials Science and Engineering (MSE), National Tsing Hua University (NTHU), Taiwan. He received Ph.D. degree in Physics from University of California, Berkeley. He served as Professor, MSE Department Chairman and Dean of the College of Engineering, President of NTHU, Vice Chancellor for Research and Development, University System of Taiwan, Deputy Minister of National Science Council. He is a member of Russian International Academy of Engineering, World Academy of Sciences and Academia Sinia, fellow of Materials Research Society (USA) and American Vacuum Society. He received William Hume-Rothery Award from the Mineral, Metallurgy and Materials Society (TMS), the Electrochemical Society (ECS) Electronics and Photonics Division (EPD) Award, Ministry of Education National Chair Professorship. His research interests include synthesis and applications of low dimensional nanomaterials, atomic scale structures and dynamic processes of advanced materials and metallization in integrated circuits devices.

Program Chair

Ming-Der Shieh 謝明得

Dean, Miin Wu School of Computing, NCKU

Dr. Ming-Der Shieh received his BSEE degree from National Cheng-Kung University (NCKU) in 1984, and the MS and PhD in EE from National Chiao-Tung University in 1986 and Michigan State University in 1993, respectively. He is now the Dean of Miin Wu School of Computing and a professor of EE Department, NCKU. He is also a HiMax Chair Professor and Senior Research Consultant of Information and Communications Research Labs (ICL) at ITRI. He previously served as the Adjunct Research Fellow at Office of Science and Technology, Executive Yuan, Chairman of EE Department at NCKU, Chairman of Taiwan IC Design Society, Deputy General Director of ICL at ITRI, and Director of Semiconductor Industry Promotion Office at Industrial Development Bureau, Ministry of Economic Affairs. The earned honors include the Golden Prize of ITRI Excellent Research Awards in 2014, and the Technology Transfer and Industrial-Academia Cooperation Awards of NCKU in 2010 and 2014. His research interests include VLSI design and test, VLSI architecture for digital signal processing, and digital communication systems.

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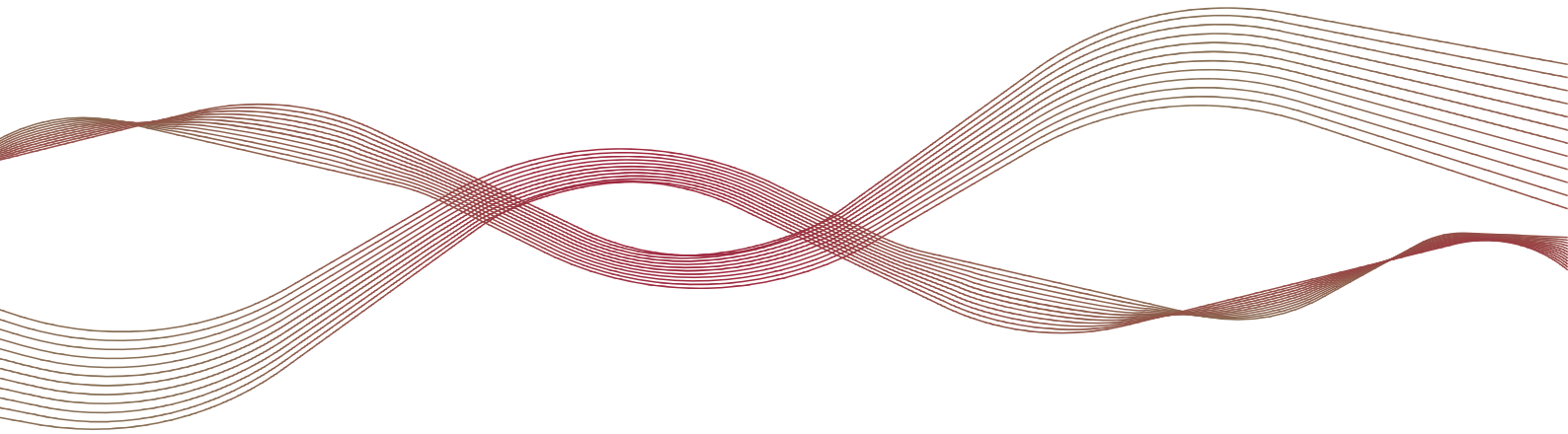
Keynote Speech



Keynote 1 Chair

Cheng-Wen Wu 吳誠文

Executive Vice President, NCKU

Dr. Cheng-Wen Wu received the BSEE degree from NTU in 1981, and the MS and PhD in ECE from UCSB in 1985 and 1987, respectively. He is currently an EVP of National Cheng Kung University and Senior Vice President of ITRI. Since 1988, he has been with the Department of EE, National Tsing Hua University (NTHU), Hsinchu, Taiwan, where he is currently a Tsing Hua Distinguished Chair Professor. He has served in the past at NTHU as the Director of Computer Center, Chair of EE Department, Director of IC Design Technology Center, Dean of the College of EECS, and Senior Vice President for Research. When he was on leave from NTHU, 2007 to 2014, he served at ITRI as the General Director of the SOC Technology Center, and the Vice President and General Director of the Information and Communications Labs.

Dr. Wu received the Distinguished Teaching Awards (twice) from NTHU, the Outstanding Electrical Engineering Professor Award from the Chinese Institute of Electrical Engineers (CIEE), the Distinguished Research Awards (three times) from National Science Council, the Industrial Collaboration Awards (twice) from the Ministry of Education (MOE), the Academic Award from the Ministry of Education (MOE), the National Endowed Chair Professorship from MOE, the EE Medal (highest honor) from CIEE, etc. His current research interests include test and repair of semiconductor memories, and design and test of symbiotic/neuromorphic IOT devices and systems. He is a life member of the CIEE, a life member of Taiwan IC Design Society, a Fellow of the ROC Technology Management Society, and a Fellow of the IEEE.

Keynote 1 Speaker

Steve Reinhardt

Partner Hardware Engineering Manager, Microsoft

Steven K. Reinhardt is a Partner Hardware Engineering Manager in the Bing Platform Engineering group. His team works closely with other Project Catapult and Project Brainwave teams across Microsoft to develop and deploy hardware accelerators for the Bing search engine.

Prior to joining Microsoft, Steve was a Senior Fellow at AMD Research, where he led research on heterogeneous systems and high-performance networking. Before that, he was an Associate Professor in the EECS department at the University of Michigan. He has also held positions at Reservoir Labs and Data General.

Steve has published over 50 refereed conference and journal articles. He was also a primary architect and developer of M5 (now gem5, http://www.gem5.org), a widely used open-source full-system architecture simulator.

Steve received a Ph.D. in Computer Sciences from the University of Wisconsin-Madison, an M.S. in Electrical Engineering from Stanford University, and a B.S. in Electrical Engineering from Case Western Reserve University. He is an IEEE Fellow and an ACM Distinguished Scientist.

Cloud-Scale Inference on FPGAs at Microsoft Bing

Microsoft' s Project Catapult began nearly a decade ago, leading to the widespread deployment of FPGAs in Microsoft' s data centers for application and network acceleration. Project Brainwave began five years later, applying those FPGAs to accelerate DNN inference for Bing and later other Microsoft cloud services. FPGA flexibility has enabled the Brainwave architecture to evolve rapidly, keeping pace with rapid developments in the DNN model space. The low cost of updating FPGA-based designs also enables greater risk taking, facilitating innovations such as our Microsoft Floating Point (MSFP) data format. FPGAs with hardened support for MSFP will provide a new level of performance for Brainwave. These AI-optimized FPGAs also introduce a new point in the hardware spectrum between general-purpose devices and domain-specific accelerators. Going forward, a key challenge for accelerator architects will be finding the right balance between hardware specialization, hardware configurability, and software programmability.

Keynote 2 Chair

Jyuo-Min Shyu 徐爵民

Emeritus Professor, Department of Computer Science, NTHU

Dr. Jyuo-Min Shyu is currently professor emeritus of NTHU, and the chairman of Cloud Computing & IoT Association in Taiwan. He joined Industrial Technology Research Institute (ITRI), Taiwan, as a researcher in 1988, held various management positions before becoming executive vice president in 2003. In 2007 he joined NTHU as Dean of the College of Electrical Engineering and Computer Science. In 2010 he was appointed as the President of ITRI. While serving at ITRI, he was a key player in many high-impact R&D initiatives as well as successful technology transfers and commercialization in Taiwan. In 2015, he was appointed as Minister of the Ministry of Science & Technology.

Dr. Shyu received the Medal of Electrical Engineering from the Chinese Institute of Electrical Engineering in 2011. He is a life fellow of IEEE, a fellow of the Chinese Society for Management of Technology (Taiwan), and a fellow of the Chinese Institute of Electrical Engineering.

Keynote 2 Speaker

Takeo Kanade 金出武雄

U.A. and Helen Whitaker University Professor,
Carnegie Mellon University

Dr. Kanade is the U. A. and Helen Whitaker University Professor of Computer Science and Robotics, and the director of Quality of Life Technology Engineering Research Center at Carnegie Mellon University. He received his Doctoral degree in Electrical Engineering from Kyoto University, Japan, in 1974. After holding a faculty position in the Department of Information Science, Kyoto University, he joined Carnegie Mellon University in 1980. He was the Director of the Robotics Institute from 1992 to 2001. He also founded the Digital Human Research Center in Tokyo and served as the founding director.
Professor Kanade works in multiple areas of robotics: computer vision, multi-media, manipulators, autonomous mobile robots, medical robotics and sensors. He has written more than 400 technical papers and reports in these areas, and holds more than 20 patents. There are more than 100,000 citations and his h-index has been within top five in Computer Science. In addition, he has been the principal investigator of more than a dozen major vision and robotics projects at Carnegie Mellon University.

Professor Kanade' s professional honors include: Election to the National Academy of Engineering, the American Academy of Arts and Sciences, a Fellow of IEEE, a Fellow of ACM, and a Fellow of American Association of Artificial Intelligence. Other several awards include Kyoto Prize, the Benjamin Franklin Institute Medal and Bower Prize, C&C Award, Okawa Award, ACM/AAAI Allen Newell Award, Joseph Engelberger Award, IEEE Robotics and Automation Society Pioneer Award, and ICCV Azriel Rosenfeld Lifetime Accomplishment Award.

Keynote 3 Chair

Burn J. Lin 林本堅

Distinguished Research Chair, Department of Electrical Engineering, NTHU

Dr. Burn J. Lin is a Distinguished Chair Professor and Director of the TSMC-NTHU Joint Research Center in National Tsing Hua University. He was a R&D Vice President of TSMC and the sole Distinguished Fellow of the TSMC Academy. Prior to joining TSMC as a Senior Director, he was a Research Staff member, Research Staff Manager, and Department manager at IBM. He has been advancing lithography for almost half a century.

Dr. Lin is a member of the US Academy of Engineering, Academician of Academia Sinica, ITRI Laureate, Fellow of IEEE and SPIE, Distinguished Alumnus of Ohio State University and National Taiwan University.

Dr. Lin has won the Future Science Prize on Mathematics and Computer Science, IEEE Nishizawa Medal, IEEE Cledo Brunetti Award, OSU Lamme medal, SPIE Frits Zernike Award, 2 TSMC Innovation Awards, 10 IBM Invention Awards, and an IBM Outstanding Technical Contribution Award.

Dr. Lin published two books, three book chapters, 132 papers, and 88 US patents.

Keynote 3 Speaker

Peter Hsieh 謝弘輝

VP, Innovation & Investment,
Strategy, Arm Taiwan Ltd.

Dr. Hsieh joined Arm as General Manager of Arm Taiwan in 2014, responsible for Taiwan business operations and management, and also established Arm's first Asia Design Center in Hsinchu, Taiwan in 2014. Prior to joining Arm, he was R & D President for Freescale Semiconductor China Design Centers, leading the team to manage over 80% of on Industrial and Automotive MCU and application processors design and development.
Dr. Hsieh was a founder and founding team member of several successful Silicon Valley start-ups including the world's first Fabless IC design company. He received "The Entrepreneur of the Year" Award in 1990 in Silicon Valley. He also built the world's first single chip CMOS RISC microprocessor under Dr. John Cocke, inventor of RISC architecture and recipient of US National Medal of Science & Technology and Turing Award, at IBM Watson Research Center. Dr. Hsieh has over 30 years of professional experience in IC design, software development and semiconductor manufacturing.
Dr. Hsieh received BSEE (Bachelor of Science in Electrical Engineering) degree from the University of California, Berkeley and then obtained MSEE and Ph.D. degrees from Massachusetts Institute of Technology with the "Best Thesis" Award from MIT EECS Department in 1979. He also studied MBA curriculum at Harvard Business School during his Ph.D.. Moreover, he served as Media Lab's Advisory Board Director from 1984 to 1987.

Future Computing Innovation and Sustainable Development

Key observation on Moore's Law is ending. Software development is based on CPU. However, control flow (Von Neumann) architecture is not efficient for AI workloads.

IoT applications generate Big Data at the edge. Big Data needs to be analyzed to become useful data. Hence, these data need to be processed by high performance, low power, edge devices. The domain specific application workloads are in the range of 1-1000 TOPS (TFLOPS).

5G will connect edge devices and the cloud. With SDN & NFV, Network Slicing will provide dedicated & secured networks for targeted applications to meet throughput and latency requirements. Therefore, huge opportunities and challenges for start-ups.

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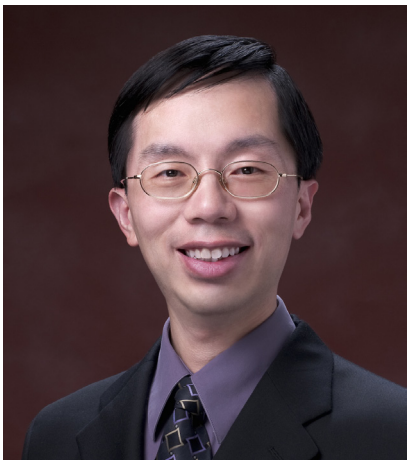
Session 1

Future Computing



Session 1 Chair

Yen-Kuang Chen 陳彥光

Vice President, Technical Activities,
Circuits and Systems Society, IEEE

Dr. Yen-Kuang Chen received his B.S. degree from National Taiwan University and his Ph.D. degree from Princeton University. He is a Senior Director and Chief Scientist of Computing Technology, Computing Technology Lab, DAMO Academy, Alibaba. He was a Principal Researcher at Intel, from 1998 to 2019. He was an adjunct professor at National Taiwan University, from 2011 to 2018. His research areas span from emerging multimedia and IoT applications to computer architecture. He has 100+ technical publications and 80+ US patents. He is one of the key contributors to Supplemental Streaming SIMD Extension 3 and Advanced Vector Extension in Intel microprocessors. He has served as a program committee member of 50+ international conferences on Internet of Things, multimedia, video communication, image processing, VLSI circuits and systems, parallel processing, and software optimization. He is the Vice President (Technical Activities) of IEEE Circuits and System Society. He was the Editor-in-Chief of IEEE Journal on Emerging and Selected Topics in Circuits and Systems, and a Distinguished Lecturer of IEEE Circuits and System Society. He is an IEEE Fellow.

Session Speaker

Tzi Cker Chiueh 闕志克

Vice President and General Director, Information and Communications Research Laboratories, ITRI

Dr. Tzi-cker Chiueh is currently the General Director of Information and Communications Labs at ITRI, and Research Professor in the Computer Science Department of Stony Brook University and National Tsing Hua University.
Before joining ITRI, Dr. Chiueh served as the director of Core Research in Symantec Research Labs. He received his BSEE from National Taiwan University, MSCS from Stanford University, and Ph.D. in CS from University of California at Berkeley in 1984, 1988, and 1992, respectively. He received an NSF CAREER award, numerous best paper awards including 2008 IEEE International Conference on Data Engineering (ICDE), 2013 ACM Systems and Storage (SYSTOR) conference, 2015 ACM Virtual Execution Environment (VEE) Conference, 2016 IEEE Infocom Test of Time Paper Award, and 2016 ACM CGO Test of Time Paper Award, and the 2019中國電機工程獎章. His current research interests lie in data/energy storage systems, DNN system architecture, and software security.

PCIe-based Rack Area Network

The vision of disaggregate rack architecture allows the resources in a rack to be flexibly shared among the servers as a global pool. Ladon is a PCI Express (PCIe) network architecture that embodies this vision using only commercially available hardware components. Ladon not only allows direct interactions between any server in rack with any PCIe resource within the same rack, but also makes it possible to turn PCIe into a low-latency and high-bandwidth network for intra-rack inter-server communications. In this talk I will go over the architectural design principles of Ladon, and describe its capabilities and prototype performance.

Session Speaker

Peter Wu 吳漢章

CEO, ASUS Cloud Corporation

Dr. Peter Wu joined ASUS Group and served as CEO of ASUS Cloud Corporation since 2008. Peter is responsible for ASUS' s development of cloud business and technologies in consumer and commercial markets and builds ecosystems in vertical industry such as education, medical, IoT, and smart city, gradually lead ASUS Cloud to become a leading brand in the field.
Peter currently also serves as CEO of ASUS Life Corporation, a member of the Smart City Committee of Taipei City, a member of Policy & Legal Committee of Cloud Computing & IoT Association in Taiwan, and serves as a number of government projects. Peter is constantly committed to assisting the digital transformation of the industry.

The Architecture of Taiwania 2: The Largest AI Supercomputer Cluster in Taiwan

Taiwania 2 is an AI supercomputer with 9 Peta Flops computing power invested by MOST in 2018~2020. Three big Taiwan ICT companies, including ASUS, Quanta and Taiwan Mobile worked together to build this system by leveraging its server, system software and networking advantages. Despite its high performance computing and super-large data capabilities, Taiwania 2 is also famous for using open source technologies at large scale. Dr. Wu has been the project in-charge since 2018, he would like to share the architecture and experiences of Taiwania 2 and the meanings behind this project for Taiwan ICT industry.

Session Speaker

CK Tseng 曾志光

President, Arm Taiwan Ltd.

CK Tseng is the President of Arm Taiwan, responsible for Arm' s business, strategy and operation in Taiwan. He has nearly 20 years of professional experience in the high-tech industry.

CK Tseng joined Arm in 2010 as a business development and sales manager, leading strategic initiatives and business engagements with key partners from silicon partners to OEMs. After then, he joined a start-up M2COMM as a Vice President of global sales and marketing, focusing on IoT innovative applications in industrial, retail and medical sectors. Besides, he also managed the oversea subsidiaries and has generated more than 10x of revenue growth in 2 years. In 2017, he re-joined Arm as senior director in charge of the sales and FAE departments in Taiwan. He was promoted to Vice President of Sales in 2018 and then President of Arm Taiwan in 2019.

CK Tseng receives a master' s degree in electrical engineering and bachelor' s degree in math at National Taiwan University.

Unleashing Future' s Technology Potential

Arm knows that dealing with that complexity would require fundamental changes in our technology approaches and how people across our sector collaborated. Hardware designers and software developers have to become even closer allies. The 10 mins short talk will covers three fundamental elements that govern why Arm has become the most widely-deployed advanced architecture ever: Power, Platform and Pervasiveness, and how will these three elements unleash future' s technology potentials.

Session Speaker

Hsien-Hsin Sean Lee 李憲信

Research Head, FAIR SysML, Facebook Boston

Research Head, FAIR SysML, Facebook Boston

Hsien-Hsin Sean Lee leads the SysML Research group at Facebook AI Research (FAIR), Boston. Previously, he directed the EDA design flow solutions and oversaw the entire PDK development for IC design customers at Taiwan Semiconductor Manufacturing Co. (TSMC), Taiwan. Prior to TSMC, he was a tenured Associate Professor at the School of Electrical and Computer Engineering, Georgia Tech, an Architecture Manager at Agere Systems and a senior processor architect at Intel. Dr. Lee holds a Ph.D. in Computer Science and Engineering from the University of Michigan, Ann Arbor. He was a receipt of the Department of Energy Early CAREER Award in 2005 and the NSF CAREER Award in 2007. He has published two book chapters and more than 100 technical articles including 4 Best Paper Awards and one 10-year most influential paper award (ITC). He served as an Associate Editor of IEEE Trans. on Computers, IEEE Trans. on CAD, ACM Trans. on Architecture and Code Optimization, and IEEE MICRO. He also served as the General Chair for IISWC 2010, the Program Co-Chair for MICRO 2016, an Executive Committee Member for IEEE-TCCA, an Industry Advisory Board Member for IEEE Computer Society and a TPC Member for more than 90 international conferences. Dr. Lee holds 19 China patents and 29 US patents and is a Fellow of the IEEE.

Session Speaker

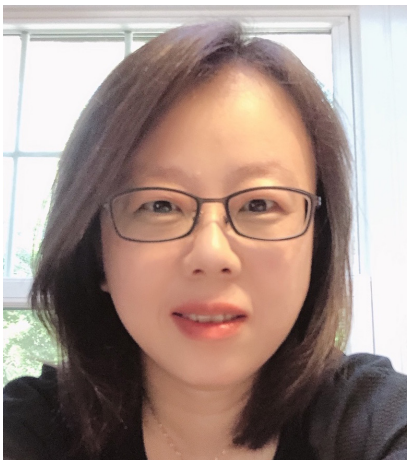
Shou-De Lin 林守德

Chief Machine Learning Scientist, Appier Inc.

Dr. Lin has more than 20 years of experience in artificial intelligence, machine learning, and natural language processing.
During his time at NTU, Dr. Lin has received several best-paper awards in international conferences. He is the recipient of several prestigious research awards including the young-scholar innovation award in FAOS, Wu Tai-Yu award in MOST. He collaborated with more than 50 companies and has won the 2007 Google Research Awards; the Microsoft Research Awards for three times; and the IBM Research Awards, the AOARD research grant award (5 times). He is also the all-time winner of the ACM KDD Cup, for which he either led or co-led the NTU team to win 7 championships.
After joining Appier, Dr. Lin has led the AiDeal team to win the Best Overall AI-based Analytics Solution in 2020 Artificial Intelligence Breakthrough Awards.

Machine Learning as a Service: Challenges and Opportunities

Thanks to the recent development of cutting-edge machine learning (ML) techniques, there is a growing number of products that are turning ML models into a long-term sustainable service with the hope that it can evolve and improve with time. In this talk, Dr. Shou-De Lin, Chief Machine Learning Scientist at Appier, will share challenges and opportunities of deploying machine learning models as a long-term service. Typically, accuracy and efficiency have been considered as key factors for evaluating the quality of ML models, but there are many other factors to consider to ensure long-term success. This talk will cover several other important aspects including the data health; model robustness; the gap between the objective and the ultimate goal; and managing bias throughout the process.



Session Speaker

Wei-Fen Lin 林偉棻

Professor, Miin Wu School of Computing, NCKU

Wei-Fen Lin is a professor in the Miin Wu School of computing at National Cheng-Kung University. She is also a senior computer architect in Google where she is working on future computing architecture design. Prior to joining the Miin Wu School of Computing, she was the VP of Engineering at Skymizer Taiwan Inc., where she led the R&D teams and oversaw the development of Skymizer products. Her current research interests include software-hardware codesign for SoC, computer architecture, machine learning accelerator design, and high-performance computing.
Dr. Lin received B.S.E in Electrical Engineering from National Taiwan University, M.S. E. in System Science Engineering and Ph.D. in Computer Science Engineering from University of Michigan, Ann Arbor. She also founded Play Lab to promote K-12 STEAM education in her spare time

The Vision on Future Computing – From Miin Wu School of Computing' s Perspective

Given the rising challenges and opportunities presented by the ubiquity of computing, the Miin Wu School of Computing (SOC) has been set at the forefront of computing and AI from the beginning. As the future computing enters the exascale era, the slowdown in silicon technology improvement and the dramatic shift toward data-centric computing have a significant impact on both the industry landscape and research direction. Our vision for the future of computing is shaped by insights from interdisciplinary research and industrial liaison with three main pillars in mind including AI, computing and applications. We envision a better world by transforming the moment with advanced computing technologies and weaving the future with intelligence. This presentation will provide attendees with a focused overview of the school of computing program design for future computing, and their potential to foster new forms of engagement and collaboration with industrial partners and interdisciplinary research communities.

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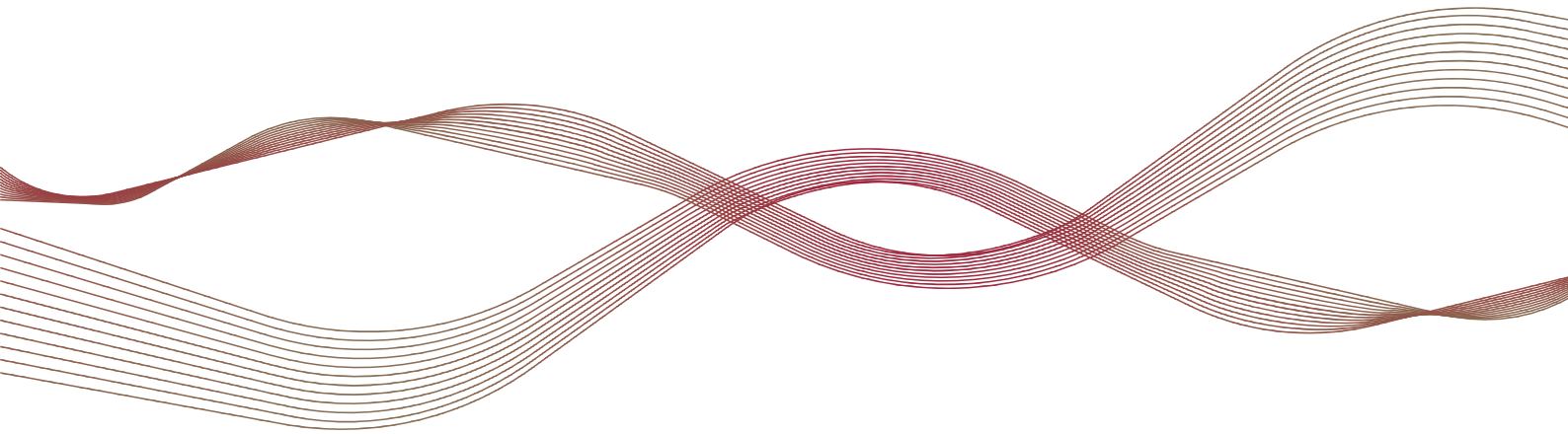
Session 2

AI Robotics



Session 2 Chair

Ren Luo 羅仁權

Irving T. Ho Chair and Distinguished Professor, Department of Electrical Engineering, NTU

Prof. Ren C. Luo, IEEE and IET Fellow, received Dipl-Ing. and Dr.-Ing. in EE from the Technische Universitaet Berlin, Germany. He serves as an Irving T. Ho Chair Professor at National Taiwan University; He served two-terms as President and Dean of Engineering of National Chung Cheng University. Prof. Luo served as a member of EU Industrial Advisory Board, Founding President of Robotics Society of Taiwan and was President of IEEE Industrial Electronics Society.

Prof. Luo was Toshiba Chair Professor in the University of Tokyo, Japan. He was an Assistant Professor, tenured Associate Professor and Full Professor of Department of ECE at North Carolina State University, Raleigh, NC, USA. He served as CTO of ASUS Group and Fair Friend Group (FFG).

Prof. Luo' s professional expertise includes intelligent robotic control systems, multi-sensor fusion, computer vision, 3D additive manufacturing. He has authored 530+ papers, published in refereed international Journals and refereed conference proceedings. As thesis adviser, Dr. Luo supervised 200+ Master and Doctoral graduates.

Prof. Luo is a current Editor- in- Chief of IEEE Transactions on Industrial Informatics (IF 9.112, 2016-present) and was EiC of IEEE/ASME Transactions on Mechatronics for 5years (IF 5.85).

Prof. Luo received IEEE Eugean Mittlemann Outstanding Research Achievement Award, IEEE IROS Harashima Innovative Technologies Award; ALCOA Company Foundation Outstanding Engineering Research Award, USA; He also served as final evaluation panel member for the competitive major research grants program in numerous international organizations and countries, such as USA, Japan, Canada, Australia, European Union, Swiss, Austria, Singapore etc.

Session Speaker

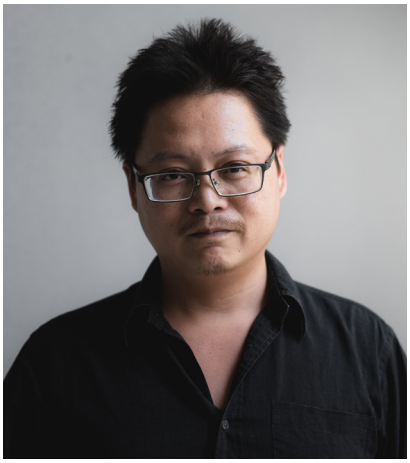
Jenn-Jier James Lien 連震杰

Professor, Miin Wu School of Computing, NCKU

Dr. Jenn-Jier James Lien received his Ph.D. degree in electrical engineering from University of Pittsburgh in 1998. From 1995 to 1998, he was a research assistant at the Robotics Institute, Carnegie Mellon University. From 1999 to 2002, he was a senior research scientist at an award face recognition and startup company, Visionics (IPO VSNX, USA), where he was also a project lead for the DARPA surveillance project on Human Identification at a Distance. In 2002, he joined department of computer science and information engineering at National Cheng Kung University (NCKU), Taiwan, as an assistant professor and director of the robotics laboratory. From 2004 to 2008, he was a co-founder of an automatic optical inspection company, BroBri Vision and as a chief technology officer (CTO). From 2009 to 2013, he was a co-founder of an embedded computer vision and surveillance company, Visionatics, and also as a CTO. He was a director of Institute of Manufacturing Information and Systems at NCKU from 2015 to 2018. His industry-academia collaboration research fields consist of deep learning for computer vision, 2D/3D automatic optical inspection, visual-guided robot arm control and automatic guided vehicle.

Automatic Visual-Guided Vehicle

This talk will be about visual-guided robot arm control and automatic visual-guided vehicle using reinforcement learning – self-learning. We will also discuss a little bit about the autonomous mobile robot (AMR) using our on-going technologies: 1) AIoT – M2M (machine to machine), and 2) Cyber-Physical System (CPS).



Session Speaker

Yang-Ting Shen 沈揚庭

Associate Professor, Department of Architecture, NCKU

Yang Ting Shen, was received the B.S. degree in Architecture from National Cheng Kung University, Tainan, Taiwan in 2003. The first M.S. degree in Architecture was also from National Cheng Kung University, Tainan, Taiwan in 2005. The second M.S. degree in Computer Science was received from Georgia Institute of Technology, Atlanta, USA in 2009. The Ph.D degree in Architecture was received from National Cheng Kung University, Tainan, Taiwan in 2012. The academic career started in Feng Chia University from 2013 to 2019. During this time, he served the head of education division in BIM Research Center, and the chairman in Master Program in Creative Design. From 2019 until now, he is the associate professor in National Cheng Kung University. In NCKU, he also serves multiple positions including the vice-CEO in RAC-Coon workshop, and the vice-director in the Techno Art program. About the outside school experience, he serves the committee of smart building in Architecture and Building Research Institute, Ministry of the Interior, Taiwan until now.

In academic field, Yang Ting Shen hosts the SyncLab and focused but not limited on the topics of Architecture Design, Computer Aided Design, Digital Fabrication (CAD to CAM), Human Computer Interaction (HCI), Building Information Modeling(BIM), Human-Robot Collaboration (HRC) etc. The cross-disciplinary research ability is one of the key values in his academic career.

Synclab: https://reurl.cc/Z7oDZl

Smart Construction: The Trend of Human-Robot Collaboration in Architecture

NCKU RAC-Coon (Robot Aided Creation and Construction) was founded in Sept. 12, 2020. RAC-Coon aims to promote the digital transformation in the Architecture and Construction-related fields and drives the promotion of smart construction Industry chain. Given that the shortage of human resource and the trend of low birth rate, the construction field faces the crisis of the imbalance between performance and cost. the intervention of robot arm for Human-Robot Collaboration (HRC) is one of the key actions to facilitate the high performance construction in the future. In this presentation, we will introduce the RAC-Coon workshop space to highlight its gold and current research works. We will show the strategy of RAC-Coon action plan both in academic education and industrial practice. In addition, we also welcome the cross-disciplinary collaboration in multiple academia and industries to build the future.

Session Speaker

Winston Hsu 徐宏民

Professor, Department of Computer Science and Information Engineering, NTU

Prof. Winston Hsu is an active researcher dedicated to large-scale image/video retrieval/mining, visual recognition, and machine intelligence. He is a Professor in the Department of Computer Science and Information Engineering, National Taiwan University and received Ph.D. (2007) from Columbia University, He and his team have been recognized with technical awards in multimedia and computer vision research communities including IBM Research Pat Goldberg Memorial Best Paper Award (2018), Best Brave New Idea Paper Award in ACM Multimedia 2017, First Place for IARPA Disguised Faces in the Wild Competition (CVPR 2018), First Prize in ACM Multimedia Grand Challenge 2011, ACM Multimedia 2013/2014 Grand Challenge Multimodal Award, etc. He served as the Associate Editor for IEEE Transactions on Circuits and Systems for Video Technology (TCSVT) and IEEE Transactions on Multimedia, two premier journals, and was on the Editorial Board for IEEE Multimedia Magazine (2010 – 2017).

Prof. Hsu is keen to realizing advanced researches towards business deliverables via academia-industry collaborations and co-founding startups. He is the Founding Director for NVIDIA AI Lab (NTU), the 1st in Asia. He was a Visiting Scientist at Microsoft Research Redmond (2014) and had his 1-year sabbatical leave (2016-2017) at IBM TJ Watson Research Center, where he contributed the first AI produced movie trailer. He is the co-founder for thingnario, a vigorous AI startup for energy optimization. He was a founding engineer and R&D manager in CyberLink Corp. (訊連). He is also helping leading companies set up and advise the AI/deep learning teams for advanced products.

3D Learning for Robotic Manipulation

Beyond 2D recognition, we observed great opportunities for 3D (point cloud) learning for robot perception and manipulation, along with the prevalence of 3D sensors such as lidar, 3D cameras, and RGB-D depth sensors. Advancing the technologies for robots, we argue (1) the generalization capability for vision-based learning algorithms for unseen objects, (2) dealing with data scarcity via few-shot, self-training, or active leaning, (3) robustness in cluttered scenes, (4) deep comprehension (situation understanding, referring, etc.) for human robot interaction, and (5) reproducibility via open source and simulation environments. For the goals, we will showcase few challenging projects such as 6-DoF grasp detection, GDN (20-fold speedup than the state-of-the-art), voice-driven 3D object referring, multi-stage few-shot learning for novel object detection, etc. We will also sketch the machine learning paradigm for 3D point clouds. We further compare variant open source simulation environments and the related benchmarks for 3D robot perception and manipulation.

Session Speaker

Ying Nian Wu 吳英年

Professor, Department of Statistics, UCLA

Ying Nian Wu is currently a professor in Department of Statistics, UCLA. He received his A.M. degree and Ph.D. degree in statistics from Harvard University in 1994 and 1996 respectively, under the supervision of Donald Rubin. He was an assistant professor in Department of Statistics, University of Michigan from 1997 to 1999. He joined UCLA in 1999. He was an assistant professor from 1999 to 2001. He was an associate professor from 2001 to 2006. He has been a full professor since 2006. Wu' s research areas include representation learning, unsupervised learning, generative modeling, computer vision, computational neuroscience, and bioinformatics. He has been an associate editor for Journal of American Statistical Association and Electronic Journal of Statistics. He is a member of IMS committee for selecting editors.

Learning Latent Space Energy-Based Prior Model for Image, Text and Molecule Generation

The generator model assumes that the observed example is generated by a low-dimensional latent vector via a top-down network, and the latent vector follows a known prior distribution, such as uniform distribution or isotropic Gaussian distribution. While learning an expressive top-down network, we can also learn an expressive prior model instead of assuming a given prior distribution. This follows the philosophy of empirical Bayes where the prior model is learned from the observed data. We propose to learn an energy-based prior model for the latent vector, where the energy function is parametrized by a simple multi-layer perceptron. We show that the learned model exhibits strong performances in terms of image, text and molecule generation, anomaly detection, and semi-supervised learning. Joint work with Bo Pang, Tian Han, Erik Nijkamp, and Song-Chun Zhu.

Session Speaker

Chih-Hung Li 李志鴻

Associate Professor, Institute of Manufacturing Technology, NTUT

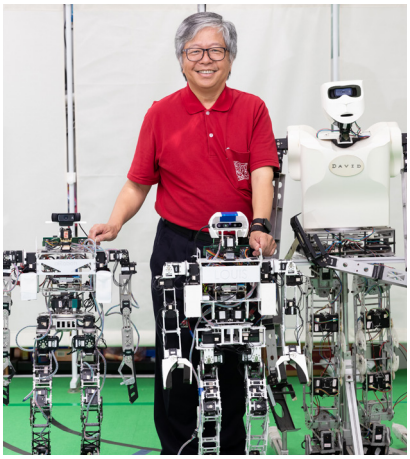
Chih-Hung G. Li received a B.S. degree in Power Mechanical Engineering from the National Tsing Hua University, Hsinchu, Taiwan in 1990, and M.S. and Ph.D. in Mechanical Engineering from Carnegie Mellon University, Pittsburgh, Pennsylvania, USA in 1994 and 1998, respectively.

He is currently an Associate Professor in the Graduate Institute of Manufacturing Technology of the National Taipei University of Technology and served as Associate Dean for the College of Mechanical and Electrical Engineering. Prior to starting his formal academic career in 2002, he served in the industry as an Engineering Specialist responsible for development and analysis of dynamic control devices in the aerospace and ground applications. From 2014 to 2017, he was the Director of the Automated Vehicle and Equipment Development Center in charge of the development of an innovative personal rapid transit system. He was also involved in multitudes of development projects including novel actuators, intelligent mobile robots, precision object localization and manipulation, visual detection, innovative damping devices, etc. His research interests are primarily in the areas of intelligent robotic and transit systems, innovative mechanisms, optimization of mechanical systems, and applied mechanics. Recent representative works include the development of a self-balancing two-wheeled robot featuring end-to-end deep visual-steering and topological localization using structured-view convolutional neural network, illumination-robust precision positioning for real-time manipulation of embedded objects, and visual rain detection and wiper control for vehicles based on deep convolutional neural network.

Development of a Self-Balancing Two-Wheeled Robot Featuring Deep Learned Visual Localization and End-to-End Steering

Common-wheeled robots are usually designed with a large base to prevent tip-over; speed and acceleration are also limited to prevent overturn. In this presentation, we report the design of a self-balancing wheeled robot, which is built on a commercialized self-balancing two-wheeled platform. A dynamic mass that imitates a human rider' s shift of COG was introduced to control the linear motion of the robot. When the manipulator is at work, the dynamic mass can also provide balance through a feed-back control scheme.

Autonomous navigation was realized by two modules – the topological localization module (TLM) responsible for recognizing the nodal locations along the routes, and the auto-steering module (ASM) that navigates the robot through the environment in a socially compliant manner. While both modules are based on the deep convolutional neural network, TLM outputs the topological location of the robot; ASM outputs the steering command that affects the robot' s moving direction.



Session Speaker

Tzuu-Hseng S. Li 李祖聖

Distinguished Professor, Department of Electrical Engineering, NCKU

Tzuu-Hseng S. Li has been with the Department of Electrical Engineering, NCKU since 1985, where he is currently a Distinguished Professor. Dr. Li was a recipient of the Outstanding Automatic Control Award in 2006 from the Chinese Automatic Control Society (CACS) and the Outstanding Robotics Engineering Award in 2017 from the Robotics Society of Taiwan (RST). He also received the Outstanding Research Award in 2017 from the Ministry of Science and Technology (MOST), Taiwan ROC. He is currently a Co-Editor-in-Chief of iRobotics, and Associate Editors of the International Journal of Fuzzy Systems and the IEEE Transactions on Cybernetics. He was the President of the CACS (2008- 2011) and the RST (2012-2015). Dr. Li is a Fellow of the CACS and RST.

Gait Pattern Control Designs for Humanoid Robots by Policy Gradient Reinforcement Learning (PGRL), Double-link Linear Inverted Pendulum Model (DLIPM), or Fuzzy Double Deep Q-Network (FDDQN)

Humanoid robot is a type of robot which possesses humanlike appearance and is able to perform human-like motions, where stable biped walking is an essential research topic in this field. In this talk, three different approaches will be presented. [1] “Walking Motion Generation, Synthesis, and Control for Biped Robot by Using PGRL, LPI, and Fuzzy Logic,” IEEE Transactions on Systems, Man, and Cybernetics—Part B: Cybernetics, vol. 41, 2011. [2] “Natural Walking Reference Generation Based on Double-Link LIPM Gait Planning Algorithm,” IEEE Access, vol. 5, 2017. [3] “Fuzzy Double Deep Q-Network-Based Gait Pattern Controller for Humanoid Robots,” IEEE Transactions on Fuzzy Systems, DOI 10.1109/TFUZZ. 2020.3033141. For the 3rd paper, ANFIS analyzes the data that comprise the inertial measurement unit (IMU) values and pressure sensor values. Then, these data are used to train the DDQN neural network. All the simulations and experiments are conducted to demonstrate the effect of the proposed gait pattern control designs.

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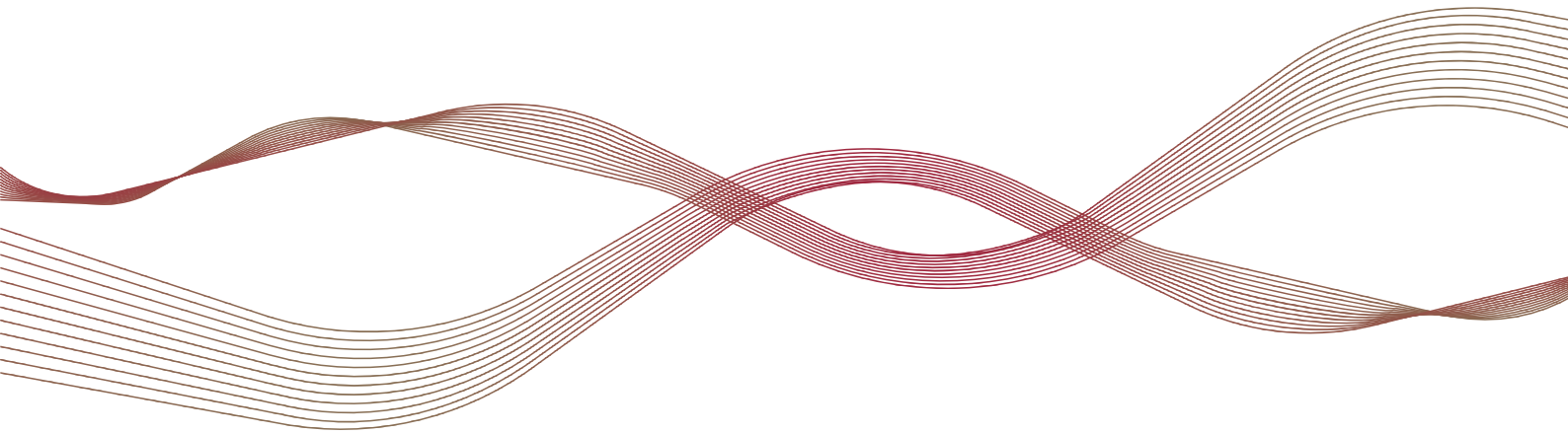
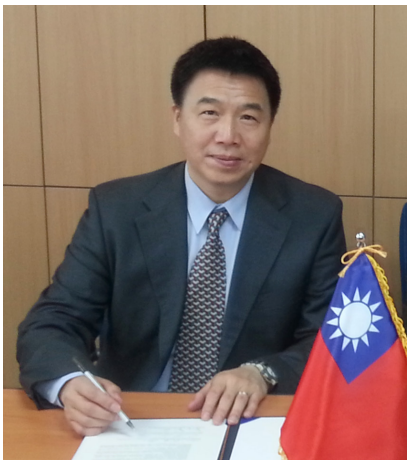
Session 3

Computational Biomedicine





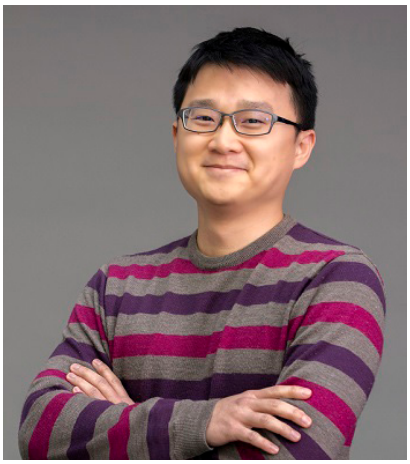
Session 3 Chair

Chun-houh Chen 陳君厚

Director, Institute of Statistical Science, Academia Sinica

Chun-houh Chen, Ph.D., Research Fellow & Director of The Institute of Statistical Science, Academia Sinica, received his Ph.D. in Mathematics (program in statistics) from the University of California, Los Angeles (UCLA) in 1992. Dr. Chun-houh Chen started his professional career as an assistant professor at The George Washington University (Department of Statistics/Computer and Information Systems), USA. In 1993, Dr. Chen went back to Taiwan to continue his research career at the Institute of Statistical Science, Academia Sinica. Development of data visualization methodologies with dimension reduction techniques were the main focus of Dr. Chen' s early research works. Through years of collaboration and application works with psychiatrists and biomedical experts Dr. Chen became and expert for matrix visualization and information mining. Dr. Chen' s group is now developing a matrix visualization environment GAP (generalized association plots) for visualizing different types of large data sets from various biomedical studies and social surveys.

Before assuming the Directorship of The Institute of Statistical Science, he served as the Director of The Department of Academic Affairs and Instrument Service, Academia Sinica (2016~2017). Dr. Chen also served positions at the following academic organizations and scientific journals: Council Member, International Statistical Institute (ISI): 2015~2019; Chairperson of The Asian Regional Section (ARS) of The International Association for Statistical Computing (IASC): 2013~2015; President of the Chinese Institute of Probability and Statistics (CIPS, Taiwan): 2013~2016; Associate Editor for BMC Research Notes, Computational Statistics and Data Analysis, Computational Statistics, Journal of the Japan Statistical Society, Journal of the Korea Statistical Society, Statistica Sinica, Taiwanese Journal of Psychiatry.



Session Speaker

Jiaxin Yu 游家鑫

Director, AI Innovation Lab, CMUH

Dr. Jiaxin Yu is the director of the AI innovation center at China Medical University Hospital and is also an assistant professor at China Medical University. He has the vision that AI will be applied widely in the fields of healthcare and biomedical science to aid in disease diagnosis, prevention, treatment and drug discovery etc. In 2019, he was a LEAP (Learn, Explore, Aspire, Pioneer) candidate and worked as a visiting researcher at the Microsoft Headquarter at Seattle, United States for about a year. Before that, he was a research associate and the deputy director at Meridigen Biotech Co., Ltd., for more than one and a half year. He holds a PhD degree in Neuroscience from the National Yang Ming University and a Bachelor degree in Psychology from the National Taiwan University. As a whole, he has extensive experiences in the development of AI tools, including machine learning and deep learning, for medical usages as well as for other purposes. Up to date, he has successfully applied 4 patents for the AI studies which he had performed before.

Accelerating digital transformation in healthcare: take antimicrobial resistance as an example

Antimicrobial resistance (AMR) is a major global problem. Antibiotic overuse and misuse are the main driving factors for AMR development. Rapid and accurate AM detection aids in realizing proper antibiotic prescription. However, current conventional approaches require 48 hours to detect AMR. Hence, there is a need to shorten the duration to reduce mortality rates and the spread of AMR. Matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS) has been used commonly in the clinical microbiology laboratory to identify bacteria. As MALDI-TOF provides mass spectra with distinctive signatures, MS data can be used as input to train ML algorithms in predicting AMR. ML has been used to improve biomedical workflow recently. In this study, ML models were developed to predict AMR for 8 different bacterial species from MALDI-TOF raw data. With ML approaches, AMR detection can now be performed in seconds and the whole process is shortened by 24 hr.

Session Speaker

Weichung Wang 王偉仲

Professor, Institute of Applied Mathematical Sciences, NTU

Dr. Weichung Wang is a professor at the Institute of Applied Mathematical Sciences, Department of Mathematics and Data Science Degree Program of National Taiwan University. His research interests include artificial intelligence for medical images and data, computational sciences, and high-performance matrix computing. He received the Nian-Tsz Award, NTU Outstanding Professor Award, MOST Outstanding Young Scholar Project, and an Honorary Research Fellow of the National Center for Theoretical Sciences. Professor Wang serves as the president of the Taiwan Society for Industrial and Applied Mathematics (TWSIAM) and has been the secretary of EASIAM and TMS. He also serves on the editorial board of international journals, including the SIAM Journal on Mathematics of Data Science, and is actively involved in major international conference organizations. Professor Wang founded MeDA Lab (Medical Data Analytics Laboratory, http://meda.ai) to develop medical AI algorithms and AI-assisted software solutions for better clinical medicine and healthcare.

Building AI-Powered Medical Data Analytics and Clinical Applications

Artificial Intelligence (AI) ‘s rapid development introduces a promising new era of smart and precision medicine and healthcare. The success of medical AI transformation relies on interdisciplinary efforts in medical domain knowledge, computer vision, machine/deep learning, applied mathematics, statistical inference, high-performance computing, high dimensional data analysis, software engineering, education, entrepreneurship, and business administration. We will illustrate our efforts to build the interdisciplinary Medical Data Analytics Platform (MeDA Platform) composed of the Artificial Intelligence Engine and Augmented Intelligence Workflows. The former AI Engine analyzes and extracts hidden information from high-dimensional medical datasets such as images and vital signals. The latter AI Workflows turns the extracted information into clinical intelligence. By deploying these AI workflows in various settings, we impact medicine and healthcare for better patient outcomes.

Session Speaker

Tsang-Wei Tu 涂倉維

Assistant Professor, Department of Radiology, Howard University

Dr. Tsang-Wei Tu is an Assistant Professor of Radiology at Howard University in Washington DC. His research interest is on the development of novel imaging methods for the detection of neurological diseases. Dr. Tu applies a multi-disciplinary approach, combining imaging technologies (MRI, CT, PET) with trauma biomechanics, immunohistochemistry, behavior, and molecular and cellular analysis to establish potential imaging biomarkers for diseases including neonatal hypoxia, diabetic retinopathy, and traumatic brain injury. Dr. Tu' s research bridges radiological findings to the underlying pathophysiology to help identification of therapeutic effects in the brain. His team has recently developed a novel machine learning system to quantify the neuroglial cells and their morphology for a better understanding how inflammatory microglia interacts with neurons in neonatal hypoxia. Dr. Tu graduated from National Cheng Kung University in 2000 with a BS and MS degree in Hydraulic Engineering. He received a PhD in Mechanical Engineering at Washington University in 2011 and completed his postdoctoral training in the Radiology and Imaging Sciences at the NIH Clinical Center in 2016. Dr. Tu is the recipient of Young Investigator Award from the Missouri SCI Research Program. His work on imaging metabolic depression after traumatic brain injury using CEST MRI was awarded research highlights in the WMIC in 2015 and 2017, and the Summa Cum Laude in the ISMRM in 2016. Dr. Tu received funding from the NIH and DoD/CNRM. His researches are published in the peer-reviewed journals, including JNeurotrauma, MRI, Annals of Neurology, Brain, Neuroimage and NMR Biomedicine.

Advancements in computational radiology and imaging sciences

Medical imaging is the vital technology in modern health care to provide physicians an essential tool to assist with diagnostics, treatment, and disease prevention. Today' s medical imaging technology evolves much more rapidly with Artificial Intelligent to facilitate doctor' s decision-making process. Novel methods based on machine learning models have been created to provide new insights to resolve unknowns in the neurobiological process by analyzing medical imaging big data or generating new imaging contrast that is unachievable before. In this session, Dr. Tu will discuss the recent advancements in computational radiology and introduce how his research on the development of imaging biomarkers may impact the norms of brain injury detection and diagnosis.

Session Speaker

Shih-Chieh Lin 林士傑

Professor, Institute of Neuroscience, NYMU

Dr. Lin received his M.D. from National Taiwan University in 2000, and Ph.D. in Neurobiology from Duke University in 2006. Prior to joining the National Yang-Ming University in 2017, Dr. Lin was a tenure-track investigator in the National Institute on Aging (NIA) of the National Institutes of Health (NIH) in the USA since 2009, where he was promoted to tenured senior investigator in 2017. The goal of Dr. Lin' s research program is to understand neural circuit mechanisms underlying cognitive functions, with a special focus on the basal forebrain (BF) neural circuitry. His laboratory combines multiple experimental approaches, including neuronal ensemble recording in behaving rats and mice, as well as behavioral, computational and optogenetic techniques. The ultimate goal is to develop therapeutic interventions that can alleviate impairments in attention control in conditions such as aging, schizophrenia and ADHD.

What can the brain teach us about future computing?

The brain is a very powerful computing machine. Understanding the algorithms underlying brain computation had inspired the development of machine learning and artificial neural network. What other lessons can the brain teach us about future computing? In this talk, I will highlight several key principles of brain computation from recent systems neuroscience research: 1) Predictive coding at every level of brain computation, from sensory, cognitive to reward prediction error; 2) Multiple teaching signals embodied by neuromodulatory systems powerfully control the activity and plasticity of the brain; 3) Balanced excitation and inhibition allows small perturbations to significantly change network dynamics; 4) Spontaneous activity during resting and sleep allows offline memory consolidation; 5) Distributed encoding of information throughout the network as a dynamical system. These principles may offer clues for next generation computers and algorithms.

Session Speaker

Henry Horng-Shing Lu 盧鴻興

Professor, Institute of Statistics, NCTU

Henry Horng-Shing Lu received his Ph.D. and M.S. degrees in Statistics from Cornell University, USA, in 1994 and 1990, respectively, and his B.S. degree in electric engineering from National Taiwan University, ROC, in 1986. He is currently a Professor in National Chiao Tung University, ROC. He also serves as the Vice President for Academic Affairs in National Chiao Tung University. He is an elected member of International Statistical Institute. His research interests include statistics, data science, image science, bioinformatics and artificial intelligence. For academic research, he and collaborators have published 76 journal papers, including Journal of the American Statistical Association, IEEE Transactions on Image Processing/ Medical Imaging/Reliability/Semiconductor Manufacturing, Pattern Recognition, Ultrasound in Medicine and Biology, Genome Research, Trends in Genetics, Proceedings of the National Academy of Sciences of the United States of America (PNAS), PLoS Computational Biology/One, Journal of Computational Biology, Bioinformatics, Scientific Reports, Gastroenterology, Circulation: Arrhythmia and Electrophysiology, and so on. He has participated in the editorial service for Handbook of Statistical Bioinformatics and Handbook for Big Data Analytics published by Springer, Journal of the American Statistical Association, Statistica Sinica, WIREs Computational Statistics, Journal of Data Science, and so forth.

Statistical Learning for AI Assisted Clinics

This study reports the co-developments of artificial intelligence (AI) assisted clinics with Taipei Veterans General Hospital. The designs of computer assisted diagnosis systems with deep learning techniques by multi-modalities of medical images are discussed for specific clinical applications. The related issues are investigated for the integration of statistical models, computational algorithms and domain knowledge. The current developments are summarized and the future potential studies are discussed.

Session Speaker

Yi-Shan Tsai 蔡依珊

Director, Clinical Innovation and Research Center,
NCKU Hospital

Dr. Yi-Shan Tsai is an Associate professor of Radiology at National Cheng Kung University and Director of Clinical Innovation and Research Center of NCKU hospital.
She is also the Division Chief of Cardiothoracic Imaging of the department of Medical imaging of NCKU Hospital. Dr. Tsai currently leads the development of the medical imaging AI and industry-hospital cooperation of NCKU hospital.

The challenges of diagnostic imaging in the era of big data

Artificial intelligence (AI) algorithms depend on the data entered into the system and subsequent training. The dataset images with corresponding findings and diagnoses need to be interpreted by a radiologist, which serves as the gold standard for diagnostic performance. Large datasets typically required but not always for imaging AI. An optimal model is not only accurate in representation of the training data, but also generalizable to unseen data. Overfitting is a major challenge in machine learning, particularly when a model is excessively complex. Deep learning may enable large-scale radiomic analysis with the potential to identify disease characteristics based on imaging patterns that not apparent to the human eye. These radiomic features represent a kind of mathematical imaging phenotype of disease expression. While talking about imaging intelligence, we should keep in mind to build a solution, not an algorithm, solve real world problems and provide value-added personalized precision medicine.

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Session 4

AI and Intelligent Mobility

Session 4 Chair

Yu-Chee Tseng 曾煜棋

Professor, College of Artificial Intelligence, NCTU

Yu-Chee Tseng received his Ph.D. in Computer and Information Science from the Ohio State University in January of 1994. He served as Chairman (2005-2009) and as Dean (2011-2017), College of Computer Science, National Chiao-Tung University (NCTU), Taiwan. Currently, he is Director of Microelectronics and Information Research Center, NCTU, and Director of Pervasive AI Research Labs, Ministry of Science and Technology.

Dr. Tseng has been awarded as NCTU Chair Professor (2011-present) and Y. Z. Hsu Scientific Chair Professor (2012-2013). He received Outstanding Research Award (National Science Council, 2001, 2003, and 2009), Academic Award (Ministry of Education), Best Paper Awards (ICPP 2003, iThings 2014, APNOMS 2015, and IoTaaS 2017), Elite I. T. Award (2004), and Distinguished Alumnus Award (Ohio State University, 2005), Y. Z. Hsu Scientific Paper Award (2009), TWAS Prize (2018), and National Chair Professorship (2020-2023). His research interests include mobile computing, wireless communication, and Internet of Things. Dr. Tseng is an IEEE Fellow. He served/serves on the editorial boards of IEEE Trans. on Vehicular Technology, IEEE Trans. on Mobile Computing, IEEE Trans. on Parallel and Distributed Systems, and IEEE Internet of Things Journal. His h-index is more than 60.

Session Speaker

Ching-Yao Chan 詹景堯

Director, Berkeley DeepDrive, UC Berkeley

Dr. Ching-Yao Chan is Co-Director of Berkeley DeepDrive (BDD), a research consortium focused on computer vision and AI technologies, with applications for autonomous driving and robotics.

Dr. Ching-Yao Chan is also a Program Manager at California PATH (Partners for Advanced Transportation Technology). PATH has been a pioneering organization in the field of intelligent transportation systems.

AI in Transportation

The speaker will share his thoughts on the prospects of AI in the field of transportation. He will first review the applications of AI and the transformational impacts due to the incorporation of AI in multiple aspects of transportation. He will then address one major paradigm shift – crowd-sourced data collection – in the landscape of transportation by introducing several examples of technical advances and business models. He will conclude his presentation by sharing his perspectives on how artificial intelligence (AI) will evolve in the future.

Session Speaker

Yi-Ting Chen 陳奕廷

Assistant Professor, Department of Computer Science, NCTU

Dr. Yi-Ting Chen will join National Chiao Tung University as an assistant professor in Spring 2021. He was a research scientist at Honda Research Institute USA since. He received a B.S. degree in Electronics Engineering from National Chiao Tung University, Hsinchu, Taiwan in 2009, and his Ph.D. degree from the Department of Electrical and Computer Engineering at Purdue University in 2015. His research interests lie in computer vision, machine learning, robotics, and behavior science, and their applications to intelligent systems.

Driver-centric Risk Assessment

Assessment and prediction of inherent risk to the driver is a central problem for the successful deployment of driver assistance and automated driving technologies. While many effective metrics have been introduced that assess risk based on distance and time to collision, such methods have strict limitations in complex and interactive urban scenes where semantic and contextual information provides important cues in modeling perceived risk. In this talk, I will present the efforts towards a predictive model that reaches human-level perception, assessment, and prediction of risk.

Session Speaker

Michael Li 李夏新

Division Director, Division for Connected & Autonomous Vehicle System, ITRI

Michael Li received a bachelor' s degree in Science and a Master' s degree in Engineering from National Tsing Hua University. Li currently works as Division Director at Industrial Technology Research Institute (ITRI) in Taiwan. Li' s past development created Taiwan' s first IEEE and ETSI compliant DSRC unit, a wireless communication device for vehicle to vehicle, or vehicle to infrastructure communication. The device was procured by USDOT, the largest and the most important DSRC research program in the US. Li' s current development focus on autonomous vehicle sensing and control, which created Taiwan' s first autonomous bus solution.

Sensing Subsystem of Autonomous Vehicles

This talk will cover the technology key issues of sensing subsystem of an autonomous vehicle, which includes sensing and perception AI algorithms, sensor fusion, event sensing, and system testing process during development.

Session Speaker

Steven Lin 林群翔

NXP Taiwan Country Manager, NXP Semiconductor

Steven Lin was appointed to be Taiwan country manager of NXP Semiconductor Taiwan in February 2019. Steven also lead our NXP Global external manufacturing quality organization that drives the selection, development and sustaining quality management of our critical supply chain to support all NXP businesses. Prior to NXP, Steven held several leadership positions on Sales, Operations, New Product Introduction, Quality and Applications at Freescale Semiconductor, E.I.DuPont EKC Taiwan, E.I. DuPont Photomask USA, SanDisk Corporation, and Destiny Technology Co. Taiwan. Steven is an experienced industry leader in semiconductor manufacturing, packaging, photomask, materials, and specialty chemicals for Automotive, Networking, Industrial and Consumer applications.

Secure connections for a smarter world

Technology begins with human nature. It only means much by providing a solution to advance human society and improve our life. Technology development had gone a long way in that we live in a world surrounded by an enormous amount of electronic devices to support what we need. It will not only grow expeditiously; it will get smarter every day and be more connected. By 2025, we believe there will be around 50 to 60 billion smart connected edge devices globally. It allows us to start building future applications for our life to be highly anticipating and automated. It also transforms our lives, including how we communicate, consume, pay, move, and work. It will bring the semiconductor and its associated industries to take a steep growth in the coming years.

Session Speaker

Chieh-Chih (Bob) Wang 王傑智

Chief Digital Officer, MMSL, ITRI

Chieh-Chih (Bob) Wang received his B.S. and M.S. from National Taiwan University, and received his Ph.D. in Robotics from the School of Computer Science at Carnegie Mellon University. Bob was an Australian Research Council (ARC) Research Fellow of the ARC Centre of Excellence for Autonomous Systems and the Australian Centre for Field Robotics at the University of Sydney from 2004 to 2005. He was with the Department of Computer Science and Information Engineering and the Graduate Institute of Networking and Multimedia at National Taiwan University from 2005 to 2015. Dr. Wang worked at the Special Projects Group of Apple Inc from 2015 to 2016. He is currently a professor with the Department of Electrical and Computer Engineering, National Chiao Tung University and the Chief Digital Officer at Mechanical and Mechatronics Systems Research Laboratories (MMSL), Industrial Technology Research Institute (ITRI). Dr. Wang received the best conference paper awards at 2003 IEEE ICRA and 2010 TAAI, the best reviewer award at 2007 ACCV, NTU Teaching Excellence Award in 2014, ITRI MMSL Outstanding Innovation Awards in 2018 and 2019, and ITRI Outstanding Research Award in 2019. His research interests include robotics, self-driving vehicles, machine perception and machine learning.

Self-Driving Vehicle Testing and Operation on Public Roads in Taiwan

The self-driving vehicle team at MMSL, ITRI completed all requested tests at Taiwan Car Lab in Tainan in July 2019 and obtained the first permission to test self-driving vehicles on public roads in Hsinchu, Taiwan in September 2019. The team also obtained the permissions to test self-driving buses in Taichung in October 2020 and has completed the first stage operation verification in November 2020. This talk will describe the experiences and lessons learned from over one-year public road testing and operations of self-driving vehicles in Taiwan.

Session Speaker

Jyh-Ching Juang 莊智清

Professor, Department of Electrical Engineering, NCKU

Jyh-Ching Juang received the B. S. and M. S. degrees from National Chiao-Tung University, Hsin-Chu, Taiwan, in 1980 and 1982, respectively, and the Ph. D. degree in electrical engineering from University of Southern California, Los Angeles, in 1987. He was with Lockheed Aeronautical System Company, Burbank before he joined the faculty of the Department of Electrical Engineering, National Cheng Kung University, Tainan, Taiwan in 1993. His research interests include control applications, GNSS signal processing, CubeSats, and autonomous systems.

Smart mobility at Shalun and Beyond

Mobility is an essential need and recent advances in intelligent mobility have made a paradigm shift in the facilitation of this basic need. To pave a way for this digital transformation of the mobility landscape, NCKU has established a multi-disciplinary team to advance connected and automated driving technologies through the development of a vehicle platform and relevant research infrastructure. The autonomous driving platform is equipped with all-around sensors including cameras, radars, lidars, and thermal imagers to make intelligent decisions. The perception capability of sensor-based solutions is, however, limited in its perception horizon. To increase the level of autonomy, a beyond-sensor-range solution is proposed. A two-way connectivity between vehicles and control center is envisioned in which vehicle-relevant information is uplinked to the control center for better monitoring and coordination, and dynamic traffic and map information is downlinked to the vehicles for safe and efficient operation. To achieve a responsive and trustworthy implementation, edge computation plays an essential role. The investigated edge computation is characterized by the software framework and, more importantly, an assessment of the real-time computational loads in autonomous driving. Overall, an integrated SPACE (Sense, Plan, Act, Connect, and Edge) technology is developed and integrated. To assess the performance, the National Cheng Kung University' s autonomous driving vehicle has been tested at the closed test site at Taiwan CAR laboratory. More recently, the system has obtained the approval from the Government to extend its operational design domain (ODD) and to perform tests at the Shalun area. This makes it possible to further advance the technologies and to establish safety schemes for the introduction of autonomous vehicles and deployment of the relevant service in Taiwan.

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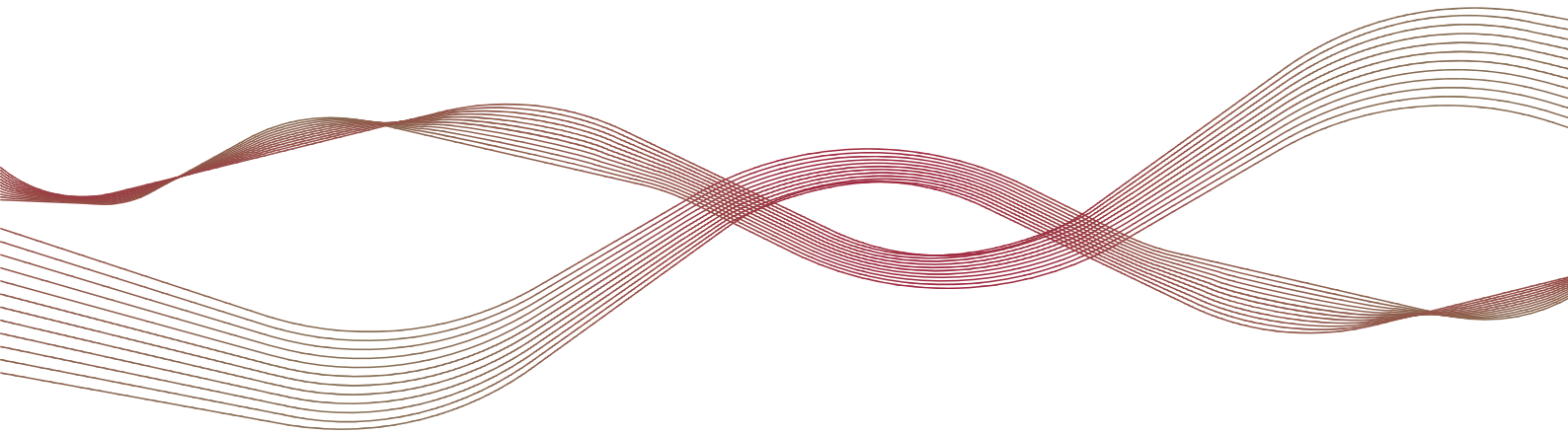
Session 5

Splendid AI Applications



Session 5 Chair

Yi-Wen Liu 劉奕汶

Distinguished Professor, Department of Electrical Engineering, NTHU

Dr. Liu, Yi-Wen received his B.S. degree in EE from National Taiwan University in 1996, and M.S. and Ph.D. degrees in EE from Stanford University in 2000 and 2006, respectively. He completed four years of post-doctoral training (2006-2010) at the Center of Hearing Research in Boys Town National Research Hospital, Omaha, USA. In 2010, he joined the Department of Electrical Engineering at National Tsing Hua University and is currently a full professor. His research topics include (1) nonlinear mechanics, wave propagation, and self-oscillation phenomena in the cochlea, (2) digital voice analysis and synthesis, and (3) industrial and biomedical applications thereof. Being an enthusiastic lecturer, he has been invited numerous times to give talks on hearing science and speech technologies both domestically and internationally. Dr. Liu was a recipient of NTHU Outstanding Teaching Award in 2014, 2017, and 2020.

Session Speaker

Jerry Chou 周志遠

Professor, Department of Computer Science, NTHU

Dr. Chou is an associate professor at the Department of Computer Science in National Tsing Hua University(NTHU) since 2011. He received his Ph.D degree in Computer Science and Engineering at University of California at San Diego(UCSD), US in 2009. Between 2009 and 2011, Dr. Chou was a member of the data management group at the Lawrence Berkeley National Lab(LBNL), and worked on various topic related to scientific data management, including energy efficiency disk storage systems, parallel data indexing and parallel file system benchmarking. After join NTHU, Dr. Chou has extended his research to cloud computing and distributed computing for big data and deep learning. Dr. Chou has published over 40 peer-review papers, including top conferences like IEEE ICDCS, IEEE/ACM Supercomputing, and top journals like IEEE Transactions on Parallel Distributed Systems, and IEEE Transactions on Networking. Dr. Chou has also served as a PC member of several conferences in distributed computing and big data, such as IEEE Cluster conference, and IEEE Datacom. Dr. Chou is current the PI of the Alliance of Cloud Technology and Services(ACTS), and the deputy director of Artificial Intelligent for Intelligent Manufacture System(AIMS) Research Center.

Solve Real World Problems By Building and Optimizing ML Pipelines on Kubernetes

With the gorwing popularity of deep learning, more efforts are required to design and implement the ML systems which aim to support ML pipelines from model developments, deployments, to operations. New research community has been formed at the intersection of traditional systems and ML communities to optimize both hardware and software systems for metrics beyond predictive accuracy. In this talk, we share our recent research efforts on building and optimizing a containerized computing platform for ML pipelines, including GPU sharing, distributed and elastic model training, deep learning workload aware resource management.

Session Speaker

Shih-Wei Liao 廖世偉

Associate Professor, Department of Computer Science and Information Engineering, NTU

Dr. Shih-wei Liao spent 22 years in Silicon Valley, working at Stanford, Intel and Google, culminating at receiving Google Founders' Award. His research area is big data, blockchain and FinTech. He launched first courses on Fintech and Blockchain at National Taiwan University.

Finance AI and Regulatory AI

Last month our team was selected for the Regulatory Technology Hackathon, hosted by the FinTech Space. The first project selected is the classification, tracing and monitoring of cryptos. Bitcoin is a crypto that features a decentralized, global and anonymous platform. Payment, investment, gambling, and even money laundering flourish on this platform. Bad behaviors discourage the support of cryptocurrency. Thus, the capability to identify criminal addresses becomes an important issue in the cryptocurrency network. We propose new features to build a classification model for detecting abnormality of a crypto address. We find several useful conventional features aka extra statistics. Also, we introduce new features including various high orders of moments of transaction time and deciles of transaction time which summarize temporal information of the transaction history in an efficient way. The extracted features are trained. Also node2vec is used. We' ll demo the tool and results. Our second project that was selected is the AI 企業健檢 doctor.

Session Speaker

Li-C. Wang 王立中

Professor, Department of Electrical and Computer Engineering, UCSB

ILi-C. Wang, is a professor of the ECE department and the Director of Computer Engineering program at University of California, Santa Barbara. He received PhD in 1996 from University of Texas at Austin, and was previously with Motorola PowerPC Design Center until 2000. Since 2003, his research has been focusing on machine learning specifically for applications in EDA and Test. He received 10 Best Paper Awards from major conferences, including the more recently from ITC 2014, ITC 2018 and 2019, VLSI DAT 2019 and VTS 2016. He is the recipient of the 2010 Technical Excellence Award from SRC and the recipient of the 2017 IEEE TTTC Bob Madge Innovation Award. He is a fellow of IEEE, and was the General Chair of the International Test Conference (ITC) in 2017 and 2018. https://iea.ece.ucsb.edu/

Practical Realization of IEA for Smart Analytics in Industry 4.0

Intelligent Engineering Assistant (IEA) is a research vision aiming to build an AI-enabled virtual assistant in the context of semiconductor product engineering. An IEA agent performs an end-to-end analytics task from raw data to generate PowerPoint presentation-like analytics results for interpretation and action. This talk discusses our effort to bring IEA vision into practical realization, in particular for smart analytics in the context of Industry 4.0. We discuss the SAT software design concept, where SAT stands for Scalability, Agility, and Transparency. The realization leads to a software platform that provides low-cost solutions to enable diverse smart analytics in a manufacturing flow, where each solution essentially is an IEA agent easily customizable by its user.

Session Speaker

Chia-Liang Kao 高嘉良

CEO, InfuseAI

clkao (Chia-liang Kao) has been an open source software developer since 2000. He believes that good collaboration model and tools drive innovation. In 2013, he created SVK, a distributed version control system that helps developers collaborate. He co-founded the g0v.tw community in 2012, advocating information transparency and digital-activism through open source model. g0v.tw was awarded as “Digital Communities: Award of Distinction” by Prix Ars Electronica 2018. He started InfuseAI in 2018 to enable data scientists to thrive, and to help wider adoption of AI across industries.

Productionizing AI and MLOps

As AI models are being deployed in business across industries, operationalizing the models and AI-powered software at scale becomes challenging. “MLOps” emerges to combine machine learning and the principals of the “DevOps” software practices.
This talk investigates the following challenges for productionizing AI models:
・unifying exploration, training, production environments
・automated/continuous retraining
・model deployment management: monitoring, updating

Session Speaker

Yu Tsao 曹昱

Deputy Director, Research Center for Information Technology Innovation, Academia Sinica

Yu Tsao received the B.S. and M.S. degrees in electrical engineering from National Taiwan University, Taipei, Taiwan, in 1999 and 2001, respectively, and the Ph.D. degree in electrical and computer engineering from the Georgia Institute of Technology, Atlanta, GA, USA, in 2008. From 2009 to 2011, he was a Researcher with the National Institute of Information and Communications Technology, Tokyo, Japan, where he engaged in research and product development in automatic speech recognition for multilingual speech-to-speech translation. He is currently an Associate Research Fellow with the Research Center for Information Technology Innovation, Academia Sinica, Taipei. His research interests include speech and speaker recognition, acoustic and language modeling, audio coding, and bio-signal processing. He is currently an Associate Editor for the IEEE/ACM Transactions on Audio, Speech, and Language Processing and IEICE Transactions on Information and Systems and a Distinguished Lecturer of APSIPA. He was the recipient of the Academia Sinica Career Development Award in 2017, the National Innovation Award in 2018 and 2019, Future Tech Breakthrough Award 2019, and the Outstanding Elite Award, Chung Hwa Rotary Educational Foundation 2019–2020.

Deep-learning-based Speech Enhancement with Its Application to Assistive Oral Communications Devices

Speech enhancement (SE) serves as a key component in most speech-related applications. The goal of SE is to enhance the speech signals by reducing distortions caused by additive and convoluted noises in order to achieving improved human-human and human-machine communication efficacy. In the this talk, we will review the system architecture and fundamental theories of deep learning based SE approaches. Next, we will present more recent advances, including end-to-end and goal-driven based SE systems as well as the SE systems with improved architectures and feature extraction procedure. The reinforcement learning and generative adversarial network (GAN)-based SE methods will also be presented. Finally, we will discuss some applications based on the deep learning SE systems, including impaired speech transformation and noise reduction for assistive hearing and speaking devices.

Session Speaker

Shao-Man Lee 李韶曼

Assistant Professor, Miin Wu School of Computing, NCKU

Shao-Man Lee currently serves as assistant professor in the School of Computing, National Cheng Kung University. She is interested in computational law, as applied in public legal discourses, legal texts, and cultural studies of law, and has written on topics including machine learning with judicial opinions, political communication and COVID-19, and popular legal communication in the era of social media. Her projects seek to adopt machine learning methods with a combination of legal, social psychological, and communication theories, aiming at bridging disciplines that provide both niches and reflections for artificial intelligence developments.

Shao-Man received her J.S.D. degree in the School of Law at the University of California at Berkeley, focusing on computational text analysis, popular legal discourse on social media, and comparative constitutional law. At Berkeley, she was awarded the Dr. and Mrs. James C.Y. Soong Fellowship and the TOP grant from the Ministry of Technology, Taiwan, and served as research assistant in the School of Law and the History Department. Shao-Man received a LL.M. from Yale Law School, where she was a Lillian Goldman Fellow. She received another LL.M. in Public Law from National Taiwan University and a LL.B. from National Taiwan University, where she was the Chief-Student Editor of National Taiwan University Law Review, a best mooter at the Constitutional Law Moot Court Competition, as well as an anchor at National Taiwan University Television. She is admitted to practice law in Taiwan.

AI and Democracy: Promises and Pitfalls

While researchers in AI and law overwhelmingly focus on providing highly accurate information extraction and case outcome prediction to decision makers, comparatively little research focuses on serving citizens in the processes of technological progress and the data-driven society. My research puts forward ways to furthering democracy, such as tracking the propagation of legal information and misinformation, analyzing public health communication strategies in comparative settings, and measuring the dynamics of the decision-making process of courts.

Instead of using data that risks digital surveillance, I argue for using open government data. Instead of using models that are expensive to train, I argue for models that empower more people to take advantage of AI or to contest AI. Instead of creating profitable systems that empower powerful institutions, I argue for creating systems that strengthen democratic accountability. I hope to bridge research projects that provide both niches and reflections for AI developments.

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Session 6

Memory-Centric Computing

Session 6 Chair

Tei-Wei Kuo 郭大維

Professor, Department of Computer Science, City University of Hong Kong and NTU

Prof. Kuo received his B.S.E. and Ph.D. degrees in Computer Science from National Taiwan University and University of Texas at Austin in 1986 and 1994, respectively. He is now Lee Shau-Kee Chair Professor of Information Engineering, Advisor to President (Information Technology), and Dean of College of Engineering, City University of Hong Kong. He is also a distinguished professor of the Department of Computer Science and Information Engineering, National Taiwan University since August 2009. His research interest includes embedded systems, non-volatile-memory software designs, neuromorphic computing, and real-time systems. Dr. Kuo is a fellow of ACM, IEEE, and US National Academy of Inventors. He is an executive committee member of IEEE TC on Real-Time Systems (TCRTS). Prof. Kuo received numerous awards and recognition, including the Outstanding Technical Achievement and Leadership Award from IEEE TC on Real-Time Systems and the Distinguished Leadership Award from IEEE TC on Cyber-Physical Systems both in 2017. Prof. Kuo serves as the founding Editor-in-Chief of ACM Transactions on Cyber-Physical Systems (since 2015), an Associate Editor of ACM Transactions on Design Automation of Electronic Systems (TODAES) and IEEE Design & Test Magazine and a program committee member of many top conferences. He has over 300 technical papers published in international journals and conferences and received many best paper awards, including the Best Paper Award from ACM/IEEE CODES+ISSS 2019.

Session VI: Memory-Centric Computing

A wide spectrum of application domains have witnessed the strong demands of Artificial Intelligence, and it results in huge memory demands because of its Big Data processing in nature. People start experiencing serious challenges to traditional Von Neumann-based architectures. As researchers begin to question whether traditional program execution models really can fit the needs of many new algorithms, such as deep learning, potential solutions to resolve I/O bottlenecks are emerging over the horizon. In this panel discussion, our panelists will present their ideas about memory-centric computing. As the panel chair, I shall explain the challenges to the Von Neumann-based architectures and to the current system-layer designs. I do hope to trigger some interesting idea exchanging among panelists and the attendants. With emerging memory technology and computing demands, we now see new and more opportunities in system designs and optimization in the coming future.

Session Speaker

Keh-Chung Wang 王克中

Chief Scientist, Emerging System Lab., MXIC

Dr. Keh-Chung Wang received a B.S. degree in physics from NTU and a Ph.D. degree in physics from Caltech. He joined Macronix as a Chief Scientist in 2015, responsible for emerging R&D in memory technologies and system applications. He served Hong Kong ASTRI as a Vice President and Group Director from 2009 to 2015, directing IC development for a broad range of applications. He had 34-year experience in IC design and management, mostly in the U.S. Dr. Wang was elected an IEEE Fellow in 2012. He was a recipient of Rockwell' s 1994 Engineer of the Year Award. He co-authored more than 160 journal and conference papers in the areas of physics, electronic devices, circuits, and systems.

Memory-Centric AI Computing

In the big data era, the data amount increases exponentially. In order to store and analyze the data timely and effectively, the trend of computing is shifting from processor-centric to memory-centric. After decades of research in artificial intelligence, practical AI applications start to enrich our lives. AI technologies are advancing very rapidly. They demand high-speed, low-power, and high-capacity computing. High-density low-latency nonvolatile memories are available, or being developed, to enlarge capacity of main computing memory to beyond terabytes, with a hybrid DRAM and NVM arrangement. This can enhance performance of mainstream von Neumann type AI computing. Novel processing-in-memory approaches have high potential of speeding up AI computing with low power consumption. They are drawing a lot of research resources. Heterogeneous IC integration technologies can further enhance AI computing performance. In this short presentation, the speaker will describe briefly these approaches and challenges for memory-centric AI computing.

Session Speaker

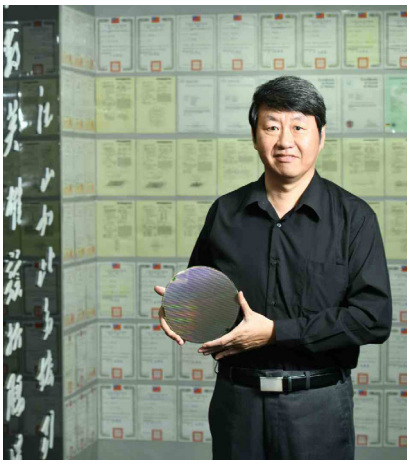
Chia-Lin Yang 楊佳玲

Professor, Department of Computer Science and Information Engineering, NTU

Chia-Lin Yang is a Professor of Computer Science and Information Engineering at NTU. Her research is in the area of computer architecture and system with focuses on storage/NVM architecture and AI-enabled edge computing. She was the General Co-chair for ISLPED 2017/Micro 2016, and the Program Co-Chair for ISLPED 2016. Dr. Yang is currently serving as an Associate Editor for IEEE Transaction on CAD, IEEE Computer Architecture Letter, ACM Transactions on Embedded Computing System, and ACM Transactions on Computer Architecture and Code Optimizations, and in the editorial board for IEEE Design & Test. She has also served on the technical program committees of several IEEE/ACM conferences, such as ISCA, ASPLOS, HPCA, ISLPED, IPDPS, ICCD, DAC, ICCAD, ISSS+CODES, CASES, Date, ASP-DAC. She received the best paper award of ISLPED 2009 and was a recipient of the 2005 and 2010 IBM Faculty Award.

Breaking the memory wall in AI

Deep learning techniques have demonstrated great success in many application domains such as computer vision, speech recognition, and natural language processing. It has been shown that the memory subsystem is the main bottleneck in executing DNN applications, including the capacity and bandwidth walls. This talk covers recent researches for tackling the memory wall challenges.



Session Speaker

Todd Lin 林功藝

Chief Technology Officer, Egis Technology Inc.

Mr. Todd Lin, CTO of Egis, has seasoned turn-around experience in various industries including of system, software, optical, silicon.
He is also a venture capitalist.
Egis Technology Inc. is leading fingerprint sensor provider around the world, Board director of fido alliance, Chair of Asia PKI Consortium

Explore applications of analog AI-in-Sensor

Illustrate a few scenario that analog AI-in-Sensor might do better than digital AI

Session Speaker

Edward Wei 魏士鈞

Senior Adviser, Realtek Semiconductor Corp

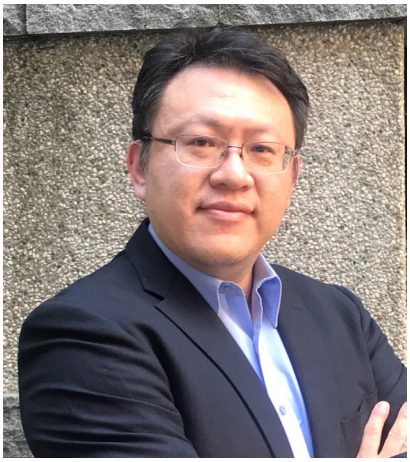
Edward has a distinguished track record with over 20 years of leadership in the technology, fabless IC design, and computer networking industries. For the last ten years he has been a senior adviser to the Office of the President, at Realtek Semiconductor Corp. Edward also served as an adviser to several startups on a pro bono basis and helped them created sustainable growth engines and business.

Prior to 2000, Edward was a serial entrepreneur and founded/cofounded several startups. He later joined Realtek to help create and enhance their SoC technology and internetworking business. His expertise encompasses semiconductor physics, hardware/software co-design, growth hacking, viral marketing, and artificial intelligence. He owns over 20 patents and has published over 30 technical articles.

Edward earned an M.S degree in Electrical Engineering from University of Southern California in 1990.

Rethink Computing for DNN

In order to process deep neural networks efficiently, we need to jump out of box and rethink how we do computation. As we all know that centralized computation is not scalable in the long run. And precise computation is no longer necessary as DNN is inherently fault tolerant. Increasing memory bandwidth alone does not solve power efficiency and thermal problem. To reduce power consumption, we need to trade space for time/frequency. Gradually we are moving away from the good old von Neumann architecture to some innovative data flow based or memory centric zero instruction architectures.



Session Speaker

Meng-Fan Chang 張孟凡

Distinguished Professor, Department of Electrical Engineering, NTHU

Dr. Meng-Fan Chang received his B.S., M.S. and PhD degrees from National Cheng-Kung University (TW), The Penn State University (US), and National Chiao Tung University (TW), respectively.

Currently, Dr. Chang is a Director at the Corporate Research of TSMC and a Distinguished Professor at National Tsing Hua University, Taiwan. Before 2006, he has worked in semiconductor industry over 10 years. His research interests include circuit designs for volatile and nonvolatile memory, computing-in-computing, neuromorphic computing, circuit-device interaction for beyond CMOS technologies, and software-hardware co-design for AI devices.

Dr. Chang has been serving on technical program committees for ISSCC, IEDM (Executive committee and MT chair), DAC (sub-com chair), ISCAS (track Chair), and numerous international conferences. He has been serving an associate editor for IEEE TVLSI, IEEE TCAS-I, and IEEE TCAD. He also has been serving as a guest editor of IEEE JSSC, IEEE TCAS-II, and IEEE JETCAS. He has been a Distinguished Lecture (DL) speaker for IEEE SSCS and CASS, technical committee Chair (NG-TC) of CASS, and the administrative committee (AdCom) member of IEEE Nanotechnology Council. He is a member of the Technical Advisory Board and Science Advisory Board of various programs of SRC. He has also been serving as the Program Director of Micro-Electronics Program of Ministry of Since and Technology (MOST) in Taiwan during 2018-2020. He is a Fellow of the IEEE.

Recent Trend of Silicon-Verfieid Computing-in-Memory Macros (CIM)

Computing-in-memory (CIM) is a promising candidate approach to breaking through this so-called memory wall bottleneck and enable AI edge devices to achieve high energy efficiency. This talk outlines the trends, and challenges involved in the further development of CIM macros. This paper also reviews recent silicon-proven CIM macros designed for multiplication-accumulation (MAC) operations.

Session Speaker

Darsen Lu 盧達生

Assistant Professor, Department of Electrical Engineering, NCKU

Darsen D. Lu received the B.S. degree in electrical engineering with special honors from National Tsing Hua University, Hsinchu, Taiwan, R.O.C., in 2005, and the M.S. and Ph.D. degrees in electrical engineering and computer sciences from the University of California, Berkeley, in 2007 and 2011, respectively. His Ph.D. work focused on compact models for multiple-gate CMOS, which led to the creation of industry standard compact models for FinFETs (BSIM-CMG) and UTB-SOI devices (BSIM-IMG). From 2011 to 2015, he was with IBM Research, Yorktown Heights, NY, USA, where he was involved with research and development for 14nm, 10nm and 7nm CMOS technologies, as well as 20nm phase change memory, with an emphasis on TCAD-based device design and process development. He is currently a Macronix Endowed Chair Professor (Assistant Professor) with the Department of Electrical Engineering at National Cheng Kung University, Tainan, Taiwan, R.O.C. His current research focuses on emerging memory device technologies such as RRAM and FeRAM, and their application to neuromorphic circuits and acceleration of deep machine learning. He is a recipient of the 2018 Taiwan Semiconductor Industry Association' s Young Faculty Award.

Memory Centric Computing on Computer Architecture, Circuit, and Semiconductor Technological Levels

We propose a revolutionary memory centric chip design and manufacturing strategy which involves non-volatile-memory-oriented semiconductor processing technology, advanced in-memory computing circuitry, as well as novel computer architecture optimized under the above constraints. Dedicated non-volatile memory manufacturing technology allows the fabrication of ultra-high-density three-dimensional memory array, which minimizes off-chip memory access for numerous data-intensive applications such as deep neural networks. In-memory computing not only reduced chip area but also maximizes power efficiency beyond 100TOps/Watts. With additional constraints such as relatively low storage cost but slow digital logic circuitry, a novel computing architecture, similar to the coarse grain reconfigurable array, is proposed to best utilize hardware resources. Such new memory centric scheme paves the way for future highly efficient artificial intelligence processors. In a research proposal involving School of Computing faculty body, we would like to verify this new idea via simulations on computer architecture, circuit, and semiconductor technological levels.

MIIN WU SCHOOL OF COMPUTING

NCKU transforms the moment with computing
to weave the future with intelligence

To cultivate talents and implement computing in fields that help to make a better world, the Miin Wu School of Computing at NCKU, based on the excellent foundations of NCKU as a comprehensive university, is designed to link external industry resources to provide a complete cross-disciplinary teaching and research environment.

Announced in August 2020, a gift of NT$1 billion from Macronix Electronics represents a fully supported commitment of NCKU towards the Miin Wu School of Computing. As mentioned at the launching ceremony by the President of NCKU, Jenny Su, with this donation NCKU seeks to propose fundamental solutions, create a new era of interdisciplinary computing talent cultivation, and set a new paradigm in Taiwan.

Vision

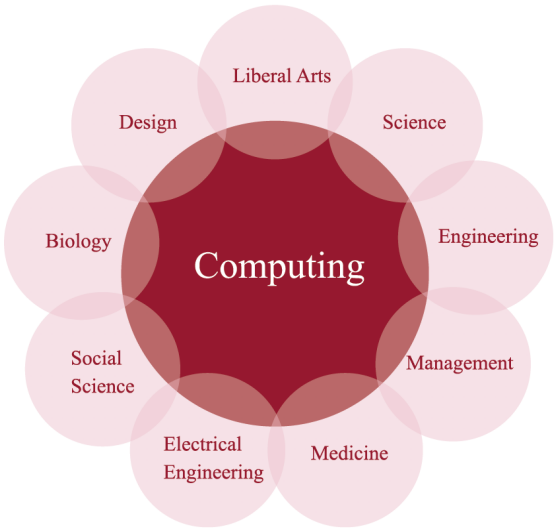
A world-leading School of Computing that fulfills social needs:

Bilingual: cultivates talents with dual competency (both domain-specific and computing expertise)

X-disciplinary: brings together niches of the 9 colleges, to develop computing-centric, cross-disciplinary technologies and applications

V-integration: conducts requirements analysis and system design to benefit the human society

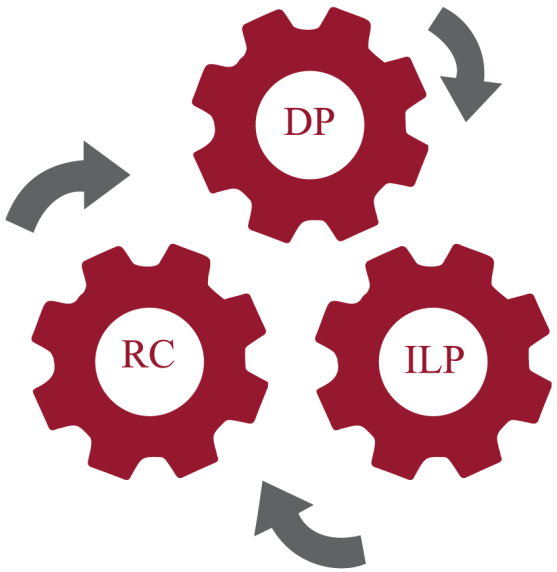
I-liaison: Establishes solid industrial and international links



MIIN WU SCHOOL OF COMPUTING

Features

A Soft School consisting of degree programs (DP), associated with research centers (RC) and industrial liaison programs (ILP)
Application-oriented research and interdisciplinary programs
Balanced funding from both private sectors and government
Tightly coupled Industrial Liaison Programs (ILP)
nterdisciplinary Research Centers for all faculty members
Highly flexible and industry-oriented degree programs
Innovative international and industrial collaboration



DIRECTIONS

Location: NCKU Future Venue, Sheng-Li Campus
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