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

成大以運算蛻變現在　以智慧織造未來

WFC

Workshop on
Future Computing

2019

國立成功大學
National Cheng Kung University
1931

Contents

WFC 2019 website

Theme

The advances in computing is reshaping the campuses in 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. Incidentally, NCKU is set to establish the first School of Computing in the country, which will likely be one of the first few such schools in the region.

This workshop will invite 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 workshop will be highly interactive; thus, we hope to serve as a catalyst for increased collaboration and discourse among participants.

Topics of the workshop include, e.g., computing frontiers, amazing AI applications, AI trends, high-performance & memory-centric computing, computational vision and linguistics, and visions on future computing.

Agenda

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 85 year 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-Chyou Wu (吳敏求), Chairman & CEO, MXIC

Dr. Miin Wu founded Macronix International Co., Ltd. in1989. Under Wu's visionary leadership, Macronix has become a leading world-class non-volatile memory company. Dr. Wu brought many of his fellow Taiwanese engineers working in the USA 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 also assisted in promoting high-tech companies as the investment target in Taiwan stock market to appeal more foreign investments. Dr. Wu has earned many recognitions such as Cover People of Forbes, "The Stars of Asia" (Business Week).

He was also awarded of "Honorary Doctorate" by National Cheng Kung University and National Tsing Hua University, 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

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 a Macronix Chair Professor and an EVP of National Cheng Kung University. He previously served as the General Director of the SOC Technology Center and the Vice President and General Director of Information and Communications Research Labs at ITRI. He had also served at NTHU as the Chair of EE Department, Director of IC Design Technology Center, Dean of the College of EECS, and Senior Vice President for Research. His interests include IC design and test, memory test and repair, and symbiotic neuromorphic computing. He is a Fellow of the IEEE.

Program Chair

Ming-Der Shieh (謝明得), Professor, Dept. of Electrical. Engineering, NCKU

Professor Ming-Der Shieh received his BSEE degree from NCKU in 1984, and the MS and PhD in EE from NCTU in 1986 and MSU in 1993, respectively. He is currently 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, Chair 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. He 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.

Program Co-Chair

Sun-Yuan Hsieh (謝孫源), Vice President for R&D, NCKU

Sun-Yuan Hsieh received the PhD degree in computer science from National Taiwan University, Taipei, Taiwan, in June 1998. He then served the compulsory two-year military service. From August 2000 to January 2002, he was an assistant professor at the Department of Computer Science and Information Engineering, National Chi Nan University. In February 2002, he joined the Department of Computer Science and Information Engineering, National Cheng Kung University, and now he is a chair professor. His awards include the 2007 K. T. Lee Research Award, President's Citation Award (American Biographical Institute) in 2007, Engineering Professor Award of Chinese Institute of Engineers (Kaohsiung Branch) in 2008, National Science Council's Outstanding Research Award in 2009, IEEE Outstanding Technical Achievement Award (IEEE Tainan Section) in 2011, Outstanding Electronic Engineering Professor Award of Chinese Institute of Electrical Engineers in 2013, and Outstanding Engineering Professor Award of Chinese Institute of Engineers in 2014. He is Fellow of the British Computer Society (BCS). Dr. Hsieh is also an experienced editor with editorial services to a number of journals, including serving as associate editors of IEEE ACCESS, IEEE Transactions on Reliability, Theoretical Computer Science (Elsevier), Discrete Applied Mathematics (Elsevier), Journal of Supercomputing (Springer), International Journal of Computer Mathematics (Taylor & Francis Group), Parallel Processing Letters (World Scientific), Discrete Mathematics, Algorithms and Applications (World Scientific), Fundamental Informaticae (Polish Mathematical Society), and Journal of Interconnection Networks (World Scientific). In addition, he has served on organization committee and/or program committee of several dozen international conferences in computer science and computer engineering. His current research interests include design and analysis of algorithms, fault-tolerant computing, bioinformatics, parallel and distributed computing, and algorithmic graph theory.

Day 1: December 16 (Monday)
Venue: Da-Cheng Hall

8:30 - 8:50
Opening

Chair
Cheng-Wen Wu 吳誠文
Executive Vice President, NCKU

Speakers

Welcome Address
Huey-Jen Jenny Su   蘇慧貞
President, NCKU

Distinguished Guest Address
Kang-Lung Wang   王康隆
Raytheon Chair Professor,
Dept. of Electrical and Computer Engineering, UCLA

Program Highlights
Ming-Der Shieh   謝明得
Professor, Dept. of Electrical Engineering, NCKU

8:50 - 9:40
Keynote Speech 1 Computational Medicine

Chair
Kang-Lung Wang   王康隆
Raytheon Chair Professor,
Dept. of Electrical and Computer Engineering, UCLA

Speaker
Yike Guo   郭毅可
Director, Data Science Institute,
Imperial College London

9:40 - 10:10
Refreshment (1F Front Entrance)

Group Photoshoot

10:10 - 11:50
Session 1
Computing
Frontiers

Chair
Tim Cheng 鄭光廷
Chair Professor and Dean of Engineering,
HKUST

Speakers

Tzi-Cker Chiueh 闕志克
Vice President and General Director, Information
and Communications Research Laboratories, ITRI

Lee-Feng Chien 簡立峰
Managing Director, Google Taiwan

Hiroshi Nakamura 中村 宏
Professor, Grauate School of Information and
Science Technology, The University of Tokyo

Shawn Blanton
Trustee Professor, Dept. of Electrical and
Computer Engineering, CMU

Chia-Liang Kao 高嘉良
CEO and Co-Founder, InfuseAI

Sun-Yuan Hsieh 謝孫源
Vice President for R&D, NCKU

12:00 - 13:30
Lunch
(The History
Museum of the
College
of Liberal Arts)

13:30 - 15:00
Session 2
Amazing AI Applications

Chair

Yu–Chong Tai 戴聿昌
Anna L. Rosen Professor of EE and MedE,
Dept. of Electrical Engineering and
Medical Engineering, Caltech

Speakers

Li-C. Wang 王立中
Professor, Dept. of Electrical and
Computer Engineering, UCSB

Wen-Sheng Feng 馮文生
General Director, Computational Intelligence
Technology Center, ITRI

Naoya Iwamoto 岩本 直也
Assistant Professor, Dept. of Electronic Systems
Engineering, National Institute of Technology
(KOSEN), Kagawa College

Ethan Tu 杜奕瑾
Founder, Taiwan AI Labs

Shyh-Nan Liou 劉世南
Chairman, Institute of Creative Industries Design,
NCKU

15:00 - 15:20
Refreshment

**15:20 - 16:50
Session 3
AI Trends**

Chair
Burn Lin　林本堅
Director, NTHU–TSMC Joint Research Center, NTHU

Speakers

Jiaxin Yu　游家鑫
Director, AI Innovation Center, CMUH

Winston Hsu　徐宏民
Professor, Dept. of Computer Science and Information Engineering, NTU

Jenn-Jier James Lien　連震杰
Professor, Dept. of Computer Science and Information Engineering, NCKU

Shih-Wei Liao　廖世偉
Associate Professor, Dept. of Computer Science and Information Engineering, NTU

Yung-Nien Sun　孫永年
Distinguished Professor, Dept. of Computer Science and Information Engineering, NCKU

**16:50 - 17:40
Campus Tour**

**17:40 - 21:00
Banquet
(38F,
Shanghai
Pavilion,
Shangri-La
Hotel)**

Chair
Huey-Jen Jenny Su　　　蘇慧貞
President, NCKU

Speaker
Miin–Chyou Wu　　　吳敏求
Chairman & CEO, MXIC
Memory-Centric Computing

Day 2: December 17 (Tuesday)
Venue: Da-Cheng Hall

8:20 - 9:10
Keynote
Speech 2
Computing
Architectures

Chair
Lih-Juann Chen 陳力俊
NTHU Distinguished Chair Professor,
Dept. of Materials Science and Engineering, NTHU

Speaker
Wen-Hann Wang 王文漢
Intel Senior Fellow Emeritus

9:10 - 9:20
Refreshment

9:20 - 10:50
Session 4

High-Performance
& AI Computing

Chair
Jyuo-Min Shyu 徐爵民
Professor Emeritus, Dept. of
Computer Science, NTHU

Speakers

Chia-Lin Yang 楊佳玲
Professor, Dept. of Computer Science
and Information Engineering, NTU

Jerry Chou 周志遠
Associate Professor, Dept. of Computer Science,
NTHU

Chi-Chuan Hwang 黃吉川
Chair Professor, Dept. of Engineering Science, NCKU

Shih-Hao Hung 洪士灝
Professor, Dept. of Computer Science
and Information Engineering, NTU

Keh-Chung Wang 王克中
Chief Scientist, Emerging System Lab., MXIC

Darsen Lu 盧達生
Assistant Professor,
Dept. of Electrical Engineering, NCKU

10:50 - 11:00
Refreshment

11:00 - 12:30
Session 5
More AI
Applications

Chair
Jane Yung-Jen Hsu 許永真
Director, NTU IoX Center, NTU

Speakers
Adam Lee 李偉智
Fellow, Dept. of Decision,
Operations and Information Technologies,
University of Maryland

Tzuu-Hseng S. Li 李祖聖
Distinguished Professor,
Dept. of Electrical Engineering, NCKU

Tom Liang 梁文隆
Chairman, Jorjin Technologies Inc.

Ying-Ching Eric Yang 楊穎青
Lead Software Engineer, Passur Aerospace

Min Sun 孫 民
Chief AI Scientist, Appier
Associate Professor, Dept. of Electrical Engineering, NTHU

Yi-Hsuan Yang 楊奕軒
Chief Music Scientist, Taiwan AI Labs

12:30 - 13:30
Lunch and
Farewell
Address
(The History
Museum
of the College
of Liberal Arts)

Chair
Cheng-Wen Wu 吳誠文
Executive Vice President, NCKU

Speaker
Ming-Der Shieh 謝明得
Professor, Dept. of Electrical Engineering, NCKU
NCKU School of Computing

Keynote Speech 1: Computational Medicine

（Day1 08:50-09:40）

Chair: Kang-Lung Wang 王康隆

Raytheon Chair Professor,
Dept. of Electrical and Computer Engineering, UCLA

Dr. Kang L. Wang is currently the Distinguished Professor and Raytheon Chair Professor in Physical Science and Electronics in the University of California, Los Angeles (UCLA). He is affiliated with the Departments of Electrical and Computer Engineering, Materials Science Engineering and Physics/Astronomy. He received his M.S. and Ph.D. degrees from the Massachusetts Institute of Technology and his B.S. degree from National Cheng Kung University (Taiwan). He is a Guggenheim Fellow, Fellows of American Physical Society and IEEE, and a Laureate of Industrial Technology Research Institute of Taiwan. He is an Academician of Academia Sinica. His awards include the IUPAP Magnetism Award and Néel Medal, the IEEE J.J. Ebers Award for electron devices, SRC Technical Excellence Award, the Pan Wen-Yuan Award, Chinese American History Makers Lifetime Achievement Award, and others. He served as the editor-in-chief of IEEE TNANO, editor of Artech House, editors for J of Spins and for Science Advances and other publications. His research areas include topological insulators – condensed matters and physics; spintronics/magnetics and nonvolatile electronics; quantum information and computing; nanoscale physics and materials; molecular beam epitaxy.

Speaker: Yike Guo 郭毅可

Director, Data Science Institute, Imperial College London

Data Efficiency in Machine Learning

Life science now is data driven. Data science provides the core technology for biomedical research, healthcare and wellbeing. This trend also provides great challenges as well as opportunities to big data research. The primary opportunity from the integration of big data into

clinical practice is for better treatment for patients, stemming from improved diagnosis and quality of care. More expansive, interlinked health records should make it easier to find suitable participants for clinical trials; likewise, finding another patient with similar symptoms should also be easier.   More opportunities are from better treatment with the approach of personalized medicine. Also, wearable sensor technology provides the revolutionary change in health monitoring. Thus, data science technologies including machine learning have profound impact to the development of future biomedical science and healthcare industry. In this talk, I will present our research in applying data science technology for healthcare and biomedical research, especially we will focus on machine learning technology for various medical applications.

Bio:

Professor Yike Guo has been the Founding Director of Data Science Institute, Imperial College London since April 2014. He is also the Dean of School of Computer Science, Shanghai University, China since April 2015.Professor Guo lectured at Imperial College London from 1997 and become professor in computing science in the Department of Computing, Imperial College in 2002. He is a world-renowned researcher in the area of big data analysis with the broad experiences of applying the data mining and machine learning technology for scientific applications, especially in the areas of engineering and medicine. In the last 20 years, he managed research projects as PI or Co-PI with total funding of £130 million (with £35m as Principal Investigator) with significant social and economic impacts. In last 17 years, he has been leading two companies, InforSense and IDBS by translating his technology achievements into successful products. He was the Chief Executive Officer of Inforsense, a spinout company of ICL he established from 1999 to 2009 and Chief Innovation Officer of IDBS, after its acquisition of Inforsense in 2009. The products Professor Guo has been leading to develop have more than 50000 users worldwide. Professor Guo has a strong collaboration with China in research and commercial development. He is non-executive director of public listed companies and involved in the development of many start-up companies. He is the Chief Strategist in Data Economy at Shanghai Industrial Technology Institute since 2013; Oversea Scientific Advisor in

Big Data of Beijing Municipality Government since 2013 and Oversea Scientific Advisor in Big Data and AI of Jiangsu Provincial Government since 2016.   He was named as one of the 10 most influential data scientists in China by China's National Information Centre in 2017 and won the prestigious Friendship Award from Jiangsu provincial government for the contribution of building up Big Data and AI industrial strategy for the province.

Keynote Speech 2: Computing Architectures

（Day2 08:20-9:10）

Chair: Lih-Juann Chen 陳力俊

NTHU Distinguished Chair Professor,
Dept. of Materials Science and Engineering, NTHU

Lih J. Chen is the Distinguished Research Chair Professor at the MSE Department, NTHU. He received Ph.D. degree in Physics from UC Berkeley. He served as Professor, MSE Department Chairman and Dean of the College of Engineering, President of NTHU, Deputy Minister of National Science Council. He is a member of World Academy of Sciences, Russian International Academy of Engineering 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 low dimensional nanomaterials and dynamic processes of advanced materials.

Speaker: Wen-Hann Wang 王文漢

Intel Senior Fellow Emeritus

"To Infinity and Beyond"— The Amazing Future of Computer Architectures

The field of Computer Architecture has entered an interesting era when Moore's Law continues to deliver on density some 10 years after the ending of Dennard scaling. Pundits called this era new golden age for Computer Architecture. Opportunities are abundant indeed for inventing new architecture constructs for the next phase of digital revolution where computing small and large becomes smarter and secure in a fully connected and immersive world. In this talk I will briefly summarize the past progress and outline prime

opportunities for aspiring computer architecture researchers for the next decade and beyond.

Bio:

Wen-Hann Wang received his BSEE from National Taiwan University, MSEE from Philips International Institute of Technological Studies in the Netherland, and Ph.D. in Computer Science from the University of Washington. Before joining Intel in 1991, Wang served as Research Staff Member at IBM T.J. Watson Research Center. Wang retired from Intel in December 2015 and was named the first-ever Intel Senior Fellow Emeritus. Prior to his retirement Wang served as Intel Corporate Vice President, Managing Director of Intel Labs, and Member of Intel Management Committee, responsible for Intel's global research in computing and communications. Wang is a fellow of the IEEE, holds 15 patents and has received numerous technical awards, including the inaugural ACM/IEEE ISCA Influential Paper Award in 2003 and an ACM SIGMETRICS best paper award in 1990.

Session 1: Computing Frontiers

（Day1 10:10-11:50）

Chair: Tim Cheng 鄭光廷

Chair Professor and Dean of Engineering, HKUST

Tim Cheng received his Ph.D. in EECS from the University of California, Berkeley. He is currently the Dean of Engineering and Chair Professor of ECE and CSE at HKUST. He worked at Bell Laboratories before he joined UCSB in 1993. He was the founding director of UCSB's Computer Engineering Program (1999-2002), Chair of the ECE Department (2005-2008) and Associate Vice Chancellor for Research (2013-2016). His current research interests include design automation for photonics IC and flexible hybrid circuits, memristive memories, mobile embedded systems, and mobile computer vision. He has co-authored five books, supervised 50 PhD theses, held 12 U.S. Patents, and published extensively in these areas. He served as Director for US Department of Defense MURI Center for 3D hybrid circuits which aims at integrating CMOS with high-density memristors. Cheng, an IEEE fellow, received 10+ Best Paper Awards from various IEEE and ACM conferences and journals. He has also received UCSB College of Engineering Outstanding Teaching Faculty Award. He served as Editor-in-Chief of IEEE Design and Test of Computers and was a board member of IEEE Council of Electronic Design Automation's Board of Governors and IEEE Computer Society's Publication Board.

Speaker 1: Tzi-Cker Chiueh 闕志克

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

Virtualization of Energy Storage Resources

One promising way to build cost-effective energy storage systems that could render such renewable energy as solar energy economically feasible, is to leverage batteries retired from electric vehicles. Such

retired batteries present two challenges. First, their safety grade is not as good as brand new batteries. Second, the charging/discharging capabilities may vary significantly from one retired battery to the next. In this short talk, I will describe the energy storage virtualization technology we have developed in the last five years to address these challenges.

Bio:

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. Dr. Chiueh has published over 250 technical papers in referred conferences and journals. His current research interest is large-scale systems software, including those related to data/energy storage systems, data center networking, and software security.

Speaker 2: Lee-Feng Chien 簡立峰

Managing Director, Google Taiwan

Taiwan's Opportunities in AIoT from an Industrial Perspective

We have seen many new developments in IoT and AI that are likely to trigger another industry revolution and transform our lives into a new era. Taiwan has a unique advantage in ICT hardware. Taiwan's industry and academia will have new opportunities. In addition, Google is expanding its engineering operations in Taiwan, which is already the largest R&D base in Asia and is working with many of Taiwan's leading

ICT companies to invest more. In this 10-minute presentation, I will try to explore a few topics/directions that can be explored further.

Bio:

Dr. Lee-Feng Chien is the Managing Director of Google Taiwan. Google Taiwan is currently the largest research and development base in the Asia Pacific region. Dr. Chien joined Google in 2006 and has been responsible for the establishment and development of the Taiwan R&D Center since then. Dr. Chien is known for his research work on Chinese search and language processing. Prior to Google, he was a Research Fellow and Deputy Director of the Institute of Information Science, Academia Sinica, Taiwan from 1993 to 2006, and also jointly appointed as a Professor of the Information Management Department of National Taiwan University from 2000 to 2006. He received his Ph.D. in CS&IE from National Taiwan University in 1991.

Speaker 3: Hiroshi Nakamura 中村 宏

Professor, Graduate School of Information Science and Technology, The University of Tokyo

Challenges for Data Driven Society

We are living in Data Driven Society, where cyber world and physical world interact tightly with huge amount and/or wide variety of data. I will introduce two efforts made in the University of Tokyo to realize the society. The first is Data Exploitation Platform supported by Japanese ministry of education. This is an infrastructure on which we are going to develop techniques on dynamic provisioning of real-time data collection / storage / analysis. The second is on VLSI design. Currently, wide variety of services gets available, each of which no doubt requires high-quality VLSIs.At the University of Tokyo, Design system laboratory, called d.lab, was launched this October with the goal of creating a design methodology and constructing a manufacturing ecosystem to enable anyone with innovative ideas to easily develop specialized devices to realize data-driven systems. Finally, I'd like to discuss the challenges we have to tackle for data driven society.

Bio:

Hiroshi Nakamura is currently a Professor in the Graduate School of Information Science and Technology at The University of Tokyo. He received his B.E, M. E and Ph.D. degree in Electrical Engineering from The University of Tokyo in 1985, 1987, and 1990 respectively. From 2014 to 2018, he was the director of the Information Technology Center at the University of Tokyo, and since 2018, he serves as the special advisor to the President on Information Technology at the University of Tokyo. His research interests include power-efficient computer architecture and VLSI design for high-performance and embedded systems.

Speaker 4: Shawn Blanton

Trustee Professor, Dept. of Electrical and Computer Engineering, CMU

Designing Secure Hardware Systems

On October 29, 2018, the United States issued an RFI that stated: "This Request for Information (RFI) from the Defense Advanced Research Projects Agency's (DARPA) Microsystems Technology Office (MTO) seeks information on technology, concepts, and approaches to support the integration of security capabilities directly into System on Chip (SoC) system design and to enable the autonomous integration and assembly of SoCs". This RFI and the hundreds of millions of dollars that the US government has subsequently invested in hardware security research and development is due to the fact that the fabrication of state-of-the-art electronics is now mostly overseas. As a result, the US government and other chip producers that create sensitive electronics are desperately searching for design methods that mitigate reverse engineering, tampering, counterfeiting, etc. In this talk, an overview of the security hardware design space will be presented followed by a discussion of the challenges of creating secure hardware.

Bio:

Shawn Blanton is the Trustee Professor in the Electrical and Computer Engineering Department at Carnegie Mellon University. His research interests are housed in the Advanced Chip Testing Laboratory (www.ece.cmu.edu/~actl) and include the design, test,

diagnosis and security of integrated systems. He has published over 200 papers in these areas and has several issued and pending. Prof. Blanton has received the National Science Foundation Career Award for the development of a microelectromechanical systems (MEMS) testing methodology and two IBM Faculty Partnership Awards. He is a Fellow of the IEEE, and is the recipient of the 2006 Emerald Award for outstanding leadership in recruiting and mentoring minorities for advanced degrees in science and technology.

Speaker 5: Chia-Liang Kao 高嘉良

CEO and Co-Founder, InfuseAI

The Future of Programming

In this talk, we review the democratization in various areas of software development, including Open Source Software, Source Control, and DevOps. Through shorter iterations and collaboration, these new paradigms are driving innovations. We will also explore how the practices are translated in the data-centric world, and what the next generation of developers are like.

Bio:

Chia-liang Kao, also known as "clkao", has been an open source software developer since 2000. Kao believes that good collaboration models and tools drive more innovation. He created SVK in 2003, a distributed version control system that helps developers collaborate.Kao co-founded the "g0v.tw" community in 2012 to advocate information transparency. With hundreds of digital tools created to help citizen participation, g0v.tw was awarded "Digital Communities: Award of Distinction" by Prix Ars Electronica 2018.Kao started InfuseAI in 2018 to help data scientists to thrive and to enable wider AI adoption across industries.

Speaker 6: Sun-Yuan Hsieh 謝孫源

Vice President for R&D, NCKU

DNA Computing: Challenges and Opportunity

DNA computing is a branch of computing which uses DNA, biochemistry, and molecular biology hardware, instead of the traditional silicon-based computer technologies. Research and development in this area concerns theory, experiments, and applications of DNA computing. DNA computing is what we would use to solve problems beyond the scope of what a classical computer can solve, just like the same way that quantum computing can break RSA encryption in moments while it might take conventional computer thousands of years to do the same.DNA computing is a form of parallel computing in that it takes advantage of the many different molecules of DNA to try many different possibilities at once. With such technology of DNA computing, it is able to solve extremely complex issues. A computation can be thought of as the execution of an algorithm, which itself can be defined as a step-by-step list of well-defined instructions that take some input, processes the data, and produces a result. In this talk, the new development of DNA computing will be briefly introduced, and some challenges for DNA Computing will be proposed introduced.

Bio:

Sun-Yuan Hsieh received the PhD degree in computer science from National Taiwan University, Taipei, Taiwan, in June 1998. He then served the compulsory two-year military service. From August 2000 to January 2002, he was an assistant professor at the Department of Computer Science and Information Engineering, National Chi Nan University. In February 2002, he joined the Department of Computer Science and Information Engineering, National Cheng Kung University, and now he is a chair professor. His awards include the 2007 K. T. Lee Research Award, President's Citation Award (American Biographical Institute) in 2007, Engineering Professor Award of Chinese Institute of Engineers (Kaohsiung Branch) in 2008, National Science Council's Outstanding Research Award in 2009, IEEE Outstanding Technical Achievement Award (IEEE Tainan Section) in 2011, Outstanding

Electronic Engineering Professor Award of Chinese Institute of Electrical Engineers in 2013, and Outstanding Engineering Professor Award of Chinese Institute of Engineers in 2014. He is Fellow of the British Computer Society (BCS). Dr. Hsieh is also an experienced editor with editorial services to a number of journals, including serving as associate editors of IEEE ACCESS, IEEE Transactions on Reliability, Theoretical Computer Science (Elsevier), Discrete Applied Mathematics (Elsevier), Journal of Supercomputing (Springer), International Journal of Computer Mathematics (Taylor & Francis Group), Parallel Processing Letters (World Scientific), Discrete Mathematics, Algorithms and Applications (World Scientific), Fundamental Informaticae (Polish Mathematical Society), and Journal of Interconnection Networks (World Scientific). In addition, he has served on organization committee and/or program committee of several dozen international conferences in computer science and computer engineering. His current research interests include design and analysis of algorithms, fault-tolerant computing, bioinformatics, parallel and distributed computing, and algorithmic graph theory.

Session 2: Amazing AI Applications

（Day 1 13:30-15:00）

Chair: Yu-Chong Tai 戴聿昌

Anna L. Rosen Professor of EE and MedE,
Dept. of Electrical Engineering and Medical Engineering, Caltech

Yu-Chong Tai is the Anna L. Rosen Professor of Electrical Engineering and Medical Engineering at Caltech. His research has been on micromechanical (MEMS) and biomedical devices such wearable heart-rate sensors, lab-on-a-chip diagnostics (e.g., complete blood count), retinal prosthetic implants, oxygen transporters for diabetic retinopathy, spinal cord implants, brain implants, micro drug delivery, etc. He is the recipient of the (Berkeley EECS) Best Thesis Award, Ross Tucker Award, , Presidential Young Investigator (PYI) Award, Packard Award, the (inaugural) IEEE Robert Bosch MEMS/NEMS Award, and National Academy Inventor Award. He has more than 700 articles/patents. He is an IEEE and AIMBE Fellow. He is also an academician of the Academia Sinica, Taiwan, ROC.

Speaker 1: Li-C. Wang 王立中

Professor, Dept. of Electrical and Computer Engineering, UCSB

Intelligent Engineering Assistant (IEA) for the Semiconductor Industry

This talk will discuss an Intelligent Engineering Assistant (IEA) that is built specifically for application contexts in a semiconductor production process. Our IEA system performs plot-based analytics based on manufacturing and test data. Machine learning techniques are employed to implement a Concept Recognition component that tries to capture human perception. Results of IEA's performance on several automotive chip product lines are shown to illustrate its role and capabilities.

Bio:

Li-C. Wang is a professor at ECE department and Director of Computer Engineering at UCSB. He received PhD in 1996 from University of Texas, Austin, and was previously with Motorola PowerPC Design Center. Starting from 2003, his research has focused on how machine learning could be utilized in semiconductor design and test flows. Prior to that, his research spanned across multiple topics in EDA and test, including microprocessor test and verification, statistical timing analysis, defect-oriented testing, and SAT solvers. He received 9 Best Paper Awards from major conferences, including those from ITC, VTS, DATE, and VLSI-DAT. He is the recipient of the 2010 Technical Excellence Award from Semiconductor Research Corporation (SRC). He is the recipient of the 2017 IEEE-TTTC Bob Madge Innovation Award. He is an IEEE fellow and served as the General Chair for the International Test Conference (ITC) in 2017 and 2018.

Speaker 2: Wen-Sheng Feng 馮文生

General Director, Computational Intelligence Technology Center, ITRI

A Self-learning Robot: A Reinforcement Learning Application in Manufacturing

Current industrial robots could only perform repeated and pre-scheduled tasks. If a product line changes, it requires engineers to spend lots of effort to re-program the robot. This kind of robot could not fulfill the mass customization requirements of Industry 4.0. With the technology of deep reinforcement learning (DRL), the robots could be self-learning and very flexible. For example, in the metal processing industry, the robot could learn to grasp or polish different metal objects in a few hours. DRL needs a large number of trials to collect data and train the agent. So a game-like robot simulator is a significant factor of success. A robot simulator imitates the real environment, and many trials can be done in a short period. As the agent learned quite well with the simulator, we could put it into the real environment to fine-tune the agent and adopt the real world. With

the help of self-learning robots, it could resolve the problems of labor shortage and engineering efforts for Taiwan industries.

Bio:

Dr. Vincent Wen-Sheng Feng joined ITRI in 1990 and is currently the general director of the Computational Intelligence Technology Center (CITC). He has more than 25 years of experience in information and communication technologies including artificial intelligence, big data analytics, and wireless communications. Dr. Feng has always been up to the challenges in various technical fields, and collaborated extensively with cross-disciplinary experts. Dr. Feng was awarded the R&D 100 Award for the Prognostic and Health Management Software for Semiconductors in 2017, the Solar Industry Awards for the Solar Radome in 2011, and the Outstanding Engineer Award from Chinese Institutes of Engineers in 2010. He is working with Taiwan's government to develop AI policies, and chairs a large AI research project aiming to accelerate the industrialization of AI technologies.

Speaker 3: Naoya Iwamoto 岩本 直也

Assistant Professor, Dept. of Electronic Systems Engineering, National Institute of Technology (KOSEN), Kagawa College

A Power Transmission Line Inspection Robot and an AI-Based Anomaly Detection System

Power transmission lines are one of the most important infrastructures of our societies. Since they are exposed to harsh weather conditions such as sea winds, storms and lightnings, they should be inspected regularly so that being maintained properly. However, most of the conventional inspection methods are time- and cost-consuming and sometimes having higher risk of accidents. In order to address these issues, a remote-controlled robot that can take high-resolution images while running on power transmission lines is developed. For detecting anomalies of the power transmission lines in the images, an AI-based system using an open-source object detection model is developed. Details of the robot and

the anomaly detection system including difficulties encountered during the development will be shared in the presentation.

Bio:

Naoya Iwamoto is an assistant professor at Department of Electronic Systems Engineering at the National Institute of Technology (KOSEN), Kagawa College, Japan. He received his Ph.D. degree from the University of Electro-Communications (Tokyo, Japan) in 2012. He worked as a postdoctoral research fellow at Japan Atomic Energy Agency from 2012 to 2013, and at the University of Oslo (Norway) from 2014 to 2015. For his Ph.D. and postdoctoral researches, he worked on developing wide bandgap semiconductor devices. After he started working at KOSEN, Kagawa College in 2016, his research field has been expanded into the other areas including robotics and artificial intelligence.
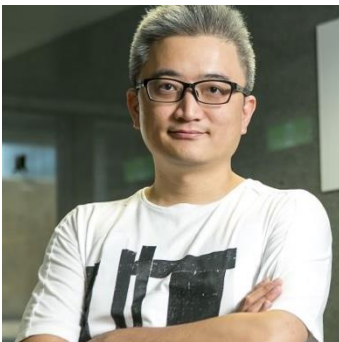
Speaker 4: Ethan Tu 杜奕瑾

Founder, Taiwan AI Labs

Innovate AI in Taiwan and for The World

AI Labs, our focus areas are Healthcare, Smart City and Human interaction and these areas include research ranging from natural language processing, computer vision to deep learning and other advanced approaches.

Ethan Tu, a former principal development manager at US-based tech giant Microsoft Corp. He is well-known as the founder of PTT, which has grown into one of Taiwan's most influential online forums since its launch in 1995.　In 2017, He founded the Taiwan AI Labs and coached the team to develop a platform to integrate AI expertise and resources from the academic, public and private sectors.

Speaker 5: Shyh-Nan Liou 劉世南

Chairman, Institute of Creative Industries Design, NCKU

Advance AI for Humanity: Challenge and Opportunity

In past decade, interdisciplinary scholars have engaged in developing technology for advancing humanity. The central issue is to reflect, as tools to pursuit wellbeing, how technology do to our mental processing and social life. In this panel talk, I would review the Google effect on shaping our learning and memory, Facebook effect on creating alone together of social life, and Game effect on identity lost in Cyber work. Drawing on these inspirations, I would then discuss how future AI development will impact the collective beliefs and value in judgement and choice, and the creativity in design and cultural mixing.

Bio:

Dr. Shyhnan Liou is currently a professor and Chair of the Institute of Creative Industries Design at National Cheng Kung University (NCKU). He received Ph.D. in Cognitive Psychology, He was the director of CUHK-NCKU joint center of Positive Social Science (CPOSS), as well as the CEO of the Research Center of Creativity, Innovation, and Entrepreneurship at NCKU. He has served as consultant for many R&D institutes include: Biomedical Technology Research & Development Institute in ITRI, MIRDC, and Development Center of Biotechnology. His research areas are mainly on team creativity processing, organizational innovation in both R&D institutes and creative industries, and transdisciplinary collaboration in integrative research. He has published five books on creativity and decision making, and fifty more journal papers and international conference papers. Prof. Liou recently has promoted Positive Social Innovation to seek to seed and grow an innovative and rigorous integrative positive social science that promotes developing technology for advancing humanity, and personal and collective wellbeing.

Session 3: AI Trends

（Day 1 15:20-16:50）

Chair: Burn Lin 林本堅

Director, NTHU-TSMC Joint Research Center, 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.

Speaker 1: Jiaxin Yu 游家鑫

Director, AI Innovation Center, CMUH

Knowledge Graph Applications in Healthcare

Concept is one or a set of abstract ideas in mind, and can present to others using images or languages. Although machines can achieve outstanding performance across classification, detection and segmentation tasks, how to make a machine to understand concept is still very challenging. In Microsoft Research, we applied Microsoft Academic Graph to build an application to accelerate the clinical trial documentation review process and recommend external domain experts when required. We now collaborate with China

Medical University Hospital to build medicine knowledge graph, and use it to improve new drug research and clinical trial design.

Bio:

Experiences:
Director @AI Innovation center, China Medical University Hospital, Taiwan   *Oct. 2019 - present*
Visiting Researcher @Microsoft Research, Redmond, WA
             Nov. 2018 - present
Big Data Engineer @Medical AI center, China Medical University Hospital, Taiwan Aug. *2017 - Sep. 2019*

Education:
- Ph.D. in Neuroscience 2011 – 2015 National Yang-Ming University, Taiwan
- M.S. in Neuroscience 2010 – 2011 National Yang-Ming University, Taiwan
- B.S. in Psychology 2003 – 2007 National Taiwan University, Taiwan

Speaker 2: Winston Hsu 徐宏民

Professor, Dept. of Computer Science and Information Engineering, NTU

Cognition Beyond 2D Images

We observed super-human capabilities from current (2D) convolutional networks for the images. Balancing industrial and academic viewpoints, we will highlight current (and future) developments in visual cognitive computing beyond 2D images. We will first demonstrate the huge opportunities as augmenting the cognition with temporal cues, 3D (point cloud) data, raw data, audio, etc. over essential domains such as entertainment, security, healthcare, manufacturing, etc. In an explainable manner, we will justify how to design neural networks leveraging the novel (and diverse) modalities. We will demystify the pros and cons for these novel signals and impacts for the industry. We will showcase a few tangible applications ranging from video QA, robotic object referring, situation understanding, autonomous driving, etc. We will also

review the lessons we learned as designing the advanced neural networks which accommodate the multimodal signals in an end-to-end manner and project the future developments.

Bio:

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, an AI startup for energy and manufacturing. He was a founding engineer and research manager in CyberLink Corp. (訊連科技), now a public image/video software company. He is also helping companies set up the AI/deep learning teams for advanced products.

Speaker 3: Jenn-Jier James Lien 連震杰

Professor, Dept. of Computer Science and Information Engineering, NCKU

Visual-Guided Robot Arm Control

This talk will focus on visual-guided robot arm control using deep learning in smart manufacturing applications. We will share our experiences and discuss the challenges we try to solve.

Bio:

Professor Jenn-Jier James Lien was a research assistant for the NIMH project: Automated Facial Expression Analysis at the RI, SCS, CMU from 1995 to 1998. From 1999 to 2002, he was a project leader for the DARPA surveillance project: Stereo-Based Face Recognition at a Distance at L-1 Identity. In 2002, he joined the department of CSIE at NCKU, Taiwan. From 2004 to 2008, his team developed computer vision and pattern recognition technologies to inspect TFT-LCD defects for AUO and ChiMei companies. From 2009 to 2013, they developed embedded computer vision technology to IP-Cam and NVR cloud computing for the surveillance marketing of Texas Instruments, USA. Since 2014, they focused on deep learning for 2D/3D robot vision and for AOI for smart manufacturing companies and semi-conductor companies.

Speaker 4: Shih-Wei Liao 廖世偉

Associate Professor, Dept. of Computer Science and Information Engineering, NTU

RegTech: Three Case Studies

Case study #1 is on 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. Case study #2 is risk evaluation in banking industry. Finally, we apply AI to underwriting and claim management. (Editor: Due to 150-word limit, we remove the next paragraph.)

Bio:

Dr. Liao Shih-Wei, Stanford University. 22 years in Silicon Valley, Intel and Google, because the contribution of Android, Google received the highest honor awarded: Founder's Award (Founders' award). His research is now big data, blockchain and FinTech. Dr. Liao is the Android compiler, Virtual machine, one Render Script engine of the author, and in National Taiwan University opened the first door FinTech & chain block courses, as well as a huge amount of information systems and application programs.

Speaker 5: Yung-Nien Sun 孫永年

Distinguished Professor, Dept. of Computer Science and Information Engineering, NCKU

Deep Learning in Medical Image Analysis

In recent years, artificial intelligence and deep learning have made major breakthroughs not only in theory but in practical applications. The use of Convolutional Neural Network (CNN) for image processing has especially made great progress. In this presentation, I will illustrate some of the possible applications of deep learning in image analysis and share some recent researches on biomedical image analysis at NCKU with you. Three research projects have been investigated in our laboratory. First is to develop the spine curvature assessment system for X-ray images using convolutional neural network. And the second is to design and implement two

automatic identification systems for X-ray and sputum smear images of Mycobacterium tuberculosis. With the developed CNN systems, image preprocessing is much simplified and the testing results usually have much higher accuracy. It greatly improves the shortcomings of traditional methods. Therefore, we would expect that the deep learning methods will have better applicability and play more important roles in medical image analysis.

Bio:

EDUCATION:

B.S.	Department of Control Engineering, National Chiao Tung University, Taiwan, 1978

M.S. Department of Electrical Engineering, University of Pittsburgh, USA, 1983

Ph.D.	Department of Electrical Engineering, University of Pittsburgh, USA, 1987

PROFESSIONAL EXPERIENCE

Principal Investigator
MOST AI Biomedical Research Center in NCKU, Tainan, Taiwan, ROC, 2018/01 – present

Director
Medical Device Innovation Center, Tainan, Taiwan, ROC, 2017/02 – 2017/07

Vice President
National Pingtung Institute of Commerce, Pingtung, Taiwan, ROC, 2009/08 – 2010/7

Vice Dean
National Cheng Kung University, Tainan, Taiwan, ROC, 2007/05 – 2009/07

Distinguished Professor
National Cheng Kung University, Tainan, Taiwan, ROC, 2002/08 – present

Professor
National Cheng Kung University, Tainan, Taiwan, ROC, 1993/08 – present

Chairman

Department of Computer Science & Information Engineering, National Cheng Kung University, Tainan, Taiwan, ROC, 1996 – 1999

Associate Professor

National Cheng Kung University, Tainan, Taiwan, ROC 1989 – 1993

Group Leader

Computer & Communication Center, National Cheng Kung University, Taiwan, 1991 – 1996

Assistant Scientist

Brookhaven National Laboratory, Long Island, NY, U.S.A., 1987 – 1989

Session 4: High-Performance & AI Computing

（Day 2　09:20-10:50）

Chair: Jyuo-Min Shyu 徐爵民

Professor Emeritus, Dept. 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 fellow IEEE, and a fellow of the *Chinese Society for Management of Technology* (Taiwan).

Speaker 1: Chia-Lin Yang 楊佳玲

Professor, Dept. of Computer Science and Information Engineering, NTU

In-Memory Computing for AI

In-memory computing provides a promising solution to improve the energy efficiency of AI algorithms. ReRAM-based crossbar architecture has gained a lot of attention recently. A few studies have shown the successful tape out of CIM ReRAM macros. In this talk, I will introduce ReRAM-based DNN accelerator designs, with emphasis on the system-level simulation method and techniques to exploit sparsity.

Bio:

Chia-Lin Yang is a Professor in the Department 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 Computer-Aided Design, IEEE Computer Architecture Letter 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, the 2005 and 2010 IBM Faculty Award, 2014 NTU EECS Academic Contribution Award, and 2019 Distinguished Electrical Engineering Professor, Chinese Inst. of Electrical Engineering.

Speaker 2: Jerry Chou 周志遠

Associate Professor, Dept. of Computer Science, NTHU

A Containerized Computing Platform for Distributed Deep Learning

The recent success of AI is driven by the deep learning techniques which requires massive amount of computing and data processing power. Hence distributed computing become a necessary mean to train deep learning in large scale. Yet, in order to build cloud platforms and computing services for deep learning with better performance and efficiency, many top-to-bottom software stack optimization problems remain to be addressed. This talk will introduce our recent work on building and optimizing one such platform based on the container and resource orchestrator technologies, like docker and Kubernetes.

Bio:

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.

Speaker 3: Chi-Chuan Hwang 黃吉川

Chair Professor, Dept. of Engineering Science, NCKU

An Advanced Network Topology for HPC

We have developed and assessed a flexible network topology, Equality, for high performance computing. Equality can be used in data centers and supercomputers, providing low latency and high throughput for state-of-the-art networking hardware. We compare Equality using cycle-accurate open-source package Bookism 2.0 with major popular network topologies, where the throughput and latency values are evaluated. The results show that equality has great potential for future data center facilities and supercomputers. Equality can be used to achieve low diameter networks with low cost. We are currently working on the application of Equality on Ethernet and InfiniBand hardware to assess its capabilities.

Bio:

Chi-Chuan Hwang was received the BS, MS and PhD degrees in the Department of Mechanical Engineering, National Cheng Kung University (NCKU). He is the Chair Professor in the Department of Engineering Science, NCKU. From 2011 to 2013 he has been the Director of Supercomputing Research Center of NCKU and is now the Director of Center of Excellence Computational Simulation, NCKU. His specialties and research interests include complex network, quantum computing, gene analysis and data assimilation. From National Science Council (NSC), R.O.C, he received ten consecutive Researcher Award from 1988 to 1997 and three consecutive Outstanding Researcher Award from 1999. Due to his contribution in Mechanics, he is a Fellow of Society of Theoretical and Applied Mechanics, R.O.C. He has published 160 journal papers.

Speaker 4: Shih-Hao Hung 洪士灝

Professor, Dept. of Computer Science and Information Engineering, NTU

Building High-Performance Deep Learning Systems

Deep learning systems are evolving quickly. In addition to developing neural network models and deep learning applications, high-performance/highly efficient systems to needed to strengthen the capability and to encourage wide deployments. For that, methods and tools are proposed to search for suitable architecture combinations of neural networks (software) and processors (hardware) for given application scenarios. This presentation will discuss some of the issues and how we attempt to solve them in our research works.

Bio:

Shih-Hao Hung is currently a professor and deputy chair of Dept. of Computer Science in National Taiwan University. He received a Ph.D. in Computer Science from University of Michigan. He is interested in topics related to high performance computing systems and artificial intelligence.

Speaker 5: Keh-Chung Wang 王克中

Chief Scientist, Emerging System Lab., MXIC

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.

Bio:

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.

Speaker 6: Darsen Lu 盧達生

Assistant Professor, Dept. of Electrical Engineering, NCKU

Artificial Intelligence with Emerging Memory Devices Utilizing Compute-in-Memory

Artificial Intelligence (AI) is powerful yet it requires tremendous computational power. Hardware accelerator for AI utilizing the concept of compute-in-memory (CIM) is very promising given its significantly lower power than state-of-the-art accelerators. CIM is a powerful type of circuits that accelerates the convolution operation in AI via analog crossbar array. It uses non-volatile memory devices as basic synaptic element to store the weight in neural networks. We are exploring the use of various emerging memory devices, such as FeRAM, RRAM, PCRAM, and Flash for CIM-based AI accelerator. In this talk, we will also introduce CIMulator, a simulation platform which predicts the power and performance for this type of new circuit architecture.

Bio:

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 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 device modeling and simulation. 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. Since 2018 he became

one of the principle investigators of the AI Creative Center at NCKU. He is also a recipient of the 2018 Taiwan Semiconductor Industry Association's Young Faculty Award.

Session 5: More AI Applications

（Day2 11:00-12:30）

Chair: Jane Yung-Jen Hsu 許永真

Director, NTU IoX Center, NTU

Jane Hsu is a Professor of Computer Science and Information Engineering at National Taiwan University, where she served as Department Chair from 2011 to 2014. As the Director of the NTU IoX Center, Prof. Hsu is leading the research on Augmented Collective Beings to facilitate human-AI/IoT collaboration. Her research interests include multiagent systems, crowdsourcing, knowledge mining, commonsense computing, and smart IoT. She has been actively involved in AAAI, TAAI, IEEE, and ACM conferences, and served as the President of Taiwanese Association for Artificial Intelligence in 2013-14. She received the 2016 MSRA Collaborative Research Award and Intel Labs Distinguished Collaborator Award.

Speaker 1: Adam Lee 李偉智

Fellow, Dept. of Decision, Operations and Information Technologies, University of Maryland

Subject Specific Computing and Intelligence

Machine learning and deep learning have reshaped the world. They have awakened artificial intelligence and transformed it to the intelligence in subject specific domains. (1) Biomedical intelligence improved diagnosis and detection in both facility and field usages. Scientists target personalized treatment and precision medicine. Clinicians and doctors will be able to recommend effective preventions. (2) In sports intelligence, managers and coaches use data to change the tradition. Typically, teams and coaches relied on the experience and intuition of scouts to recruit players. With big data collection and analytics, recruit became more effective and successful to benefit both team and player. Furthermore, learning results provide models and patterns to support and assist coaches and players in real time. Every play or change in the field will trigger a new prediction by

processing live feeds to adapt real-time updates. (3) Business analytics and intelligence integrates computing and strategies together in business and management. It learns and retrieves meaningful and useful knowledge to escalate decision making.

Bio:

Woei-jyh (Adam) Lee worked on distributed objects and fault tolerance at AT&T Labs - Research in 1997. He focused on network software at Bell Laboratories Research from 1998-2000. He visited University of Southern California specializing in continuous media streaming from 2002-2003.He contributed in protein domain parsing at National Cancer Institute (NCI), National Institutes of Health (NIH) from 2004-2005. He was a fellow focusing on human genetics and genomics at National Library of Medicine, NIH from 2009-2012. He became a special volunteer working on computational modeling for cancer progression and metastatic at NCI, NIH from 2012-2013.He is currently a faculty at Robert H. Smith School of Business, University of Maryland at College Park since 2012. His research interests include big data and data sciences, sports and business intelligence, bioinformatics and computational biology. He has two US Patents.

Speaker 2: Tzuu-Hseng S. Li 李祖聖

Distinguished Professor, Dept. of Electrical Engineering, NCKU

Robots That Think Fast and Slow: Examples of Throwing the Ball into the Basket and Playing the Pitching Game

Can a robot think like a human being? Scientists in recent years have been trying to achieve this dream, and we are also committed to this same goal. The psychology concepts were adopted from Thinking, Fast and Slow by Daniel Kahneman, where the human brain comprises two systems, System 1 and System 2. Based on their characteristics, System 1 and System 2 handle different tasks during cerebration. A cognition learning algorithm is presented and examined in a humanoid robot, where Deep Belief Network is trained to construct the function of System 1 for the rapid reaction. On the other hand, Particle Swarm Optimization is applied to build System 2

for the slow and complicated brain behavior. In this talk, we set up two experiments for the humanoid robot to throw the ball into the basket and play a pitching game. These experiments verify that the thinking mode of human beings is reasonable and effective in robots.

Bio:

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, Taiwan. 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.

Speaker 3: Tom Liang 梁文隆

Chairman, Jorjin Technologies Inc.

A² i R (AI+AR) Smart Space New Vision

- After Mobile, What's Next?
- AR glasses key Characteristic: See-Through Vision
- What is VR/AR/MR, XR?
- AR Futures Evolution: AR Smart Glasses → A² i R Smart Space
- Jorjin AR Glasses' Successful Experiences
- AR Glasses for Various field applications
- Smart Glasses Partner Value Chain

Bio:

Jorjin Technologies was founded in 1997 as a company specialized in miniaturization of electronic circuits (**SIPs, SOMs**,). Along the years, Jorjin built multiple additional skills which enabled it to become a leader in **IIOT and Wearables**, with a special focus on **AR/MR Smart Glasses solution.**

Speaker 4: Ying-Ching Eric Yang 楊穎青

Lead Software Engineer, Passur Aerospace

Predictive Analytics for Optimal Aviation System Performances

More people than ever are flying today, putting pressure onto the aviation industry and air traffic service authorities to sustain increased service while assuring highest degree of flight safety. Owing to public investment in traffic surveillance infrastructure and its early adoption of information technology, the industry has amassed huge sets of publicly accessible data. Therefore, we are in a good position to harness recent advances in data science and machine learning to optimize every part of the system operations. As a value-added service provider, we view the main engine of aviation system operations as driven by time. Predictive analytics techniques are applied to yield better advance estimates of when airplane A will reach place B, e.g., when it will arrive at gate or how long it is expected to be held and where. These knowledges enable new application software that improves operators' capability of early decision-making and intervention, which in turn improve customer experience and company bottom lines.

Bio:

Dr. Yingching (Eric) Yang is a senior engineer with broad-based knowledge of aircraft communications, surveillance, and navigation (CNS), air traffic and airport operations management systems and system safety model. He was key software designer of one of the earliest operational wide-area multilateration (WAM) aircraft surveillance systems known as AirScene and received a US Patent on its multilateration software technologies. From sensor and systems architecture design to test and final acceptance tests, he has extensive experience in the implementation process of modern aircraft surveillance system based on WAM and automatic dependent surveillance-broadcasting (ADS-B).

Dr. Yang received his BS degree from National Taiwan University, and MS and PhD degrees in Massachusetts Institute of Technology,

all in Electrical Engineering. His field of specialty is in electromagnetics.

From 1989 to 1999, he served as a Research Scientist at the Research Laboratory of Electronics in MIT. Under the sponsorship of US Department of Transportation, the Federal Aviation Administration (FAA), and National Air Traffic Services (NATS) of the UK, his group developed simulation models help air-navigation service providers and regulatory bodies forming transitional plan to future radio-navigation technologies. He received 1990 Henry G. Booker Award for Outstanding Young Scientist in Radio Science from URSI US National Committee.

In 1999 he joined Rannoch Corporation (Alexandria, VA, USA) and reached across to technology development, eventually becoming the lead person on multilateration and automatic dependent surveillance-broadcasting (ADS-B) surveillance technology within the company. From 2012 to 2016 he was with Metron Aviation (Dulles, VA, USA), where he took on air traffic management (ATM) aspects of aviation systems engineering. He was in charge of algorithm development of Harmony for ANSPs, a commercial air traffic flow management (ATFM), and conducted analysis of air traffic safety model with different automatic traffic avoidance system architecture and mixture of manned and unmanned aircraft systems. At his current position as lead software engineer with Passur Aerospace (Stamford, CT, USA), he is concentrated on data fusion algorithm as the underlying foundation of machine learning software for improving operational performance of aviation systems.

Speaker 5: Min Sun 孫民

Chief AI Scientist, Appier
Associate Professor, Dept. of Electrical Engineering, NTHU

360 Understanding of Indoor Activities Using AI

We present several AI methods to understand indoor environments like 3D layout and indoor human activities for the purpose of intelligent daily routine assistance.

Bio:

Dr. Min Sun is the Chief Artificial Intelligence (AI) Scientist of Appier. He joined Appier from National Tsing Hua University (NTHU), where he served as an Associate Professor in the Department of Electrical Engineering. Dr. Sun received his Ph.D. in Electrical Engineering: System from the University of Michigan and his M.S in Electrical Engineering from Stanford University. His areas of expertise are computer vision, natural language processing, deep learning, and reinforcement learning. From 2015-2017, Dr. Sun has won CVGIP Best Paper Awards three times in a row. He is also the recipient of the Creative Young Scholar Award from the Foundation for the Advancement of Outstanding Scholarship in Taiwan. Before joining NTHU, he was a postdoctoral fellow in Computer Science & Engineering at the University of Washington.

Speaker 6 : Yi-Hsuan Yang 楊奕軒

Chief Music Scientist, Taiwan AI Labs

Machine Learning for Creative AI Applications in Music

I plan to talk about some projects we have been working at the crossroads of AI and music at the Academia Sinica and the Taiwan AI Labs. Specifically, I will talk about how we develop machine learning techniques to analyze music and learn to compose and perform music. Topics that I might cover will include automatic singing/background music separation, automatic music transcription, algorithmic composition, and Jazz music generation.

Bio:

Yi-Hsuan Yang is an Associate Research Fellow of the Research Center for IT Innovation, Academia Sinica, and also the Chief Music Scientist at the TaiwanAI Labs. He received his Ph.D. degree in Communication Engineering from National Taiwan University in 2010. His research interests include music information retrieval, artificial intelligence, affective computing, and machine learning. Dr. Yang was a recipient of the 2011 IEEE Signal Processing Society Young Author Best Paper Award, the 2012 ACM Multimedia Grand Challenge First

Prize, the 2014 Ta-You Wu Memorial Research Award of the Ministry of Science and Technology, Taiwan, the 2015 Young Scholars' Creativity Award from the Foundation for the Advancement of Outstanding Scholarship, and the 2019 Multimedia Rising Stars Award from the IEEE International Conference on Multimedia Expo. He is an author of the book Music Emotion Recognition (CRC Press 2011). He was a Technical Program Co-Chair of the International Society for Music Information Retrieval Conference (ISMIR) in 2014. He was an Associate Editor for the IEEE Transactions on Affective Computing and the IEEE Transactions on Multimedia, both from 2016 to 2019. Dr. Yang is a senior member of the IEEE.

NCKU School of Computing

NCKU transforms the present with computing; weaves the future with intelligence.

The School of Computing at National Cheng Kung University (NCKU) hopes to implement strong integration between cross-disciplinary applications and computing power. In addition to responding to current development trends for AI applications, emphasis is placed on providing dual-competency talent cultivation in terms of education and research in computing science, technology, and applications that fulfill social needs. Students in the School will be equipped with the ability to integrate computing technology into other specialized fields, capable of conducting requirements analysis and system design in certain application domains.

The School is planned to bring together the existing niches of NCKU's nine colleges to develop computing-centric, cross-disciplinary technologies and innovative applications with globally competitive advantages. Solid industry and international links will be established through diverse channels of education and research collaboration such as the industrial affiliates program and various international student exchange programs. The School is expected to recruit around fifty faculty members to meet the needs of the School's operations and fields of expertise in the first ten years. These faculty members will include existing jointly-appointed university faculty and newly recruited top/renowned scholars, especially experts in computing theory and emerging computing technologies, e.g., neuromorphic and memory-centric computing architectures and quantum computing.

The School will offer student-centered, domain-oriented curricula to cultivate bilingual talents with dual competency. Students will be supervised by university and industrial teachers with cross-disciplinary expertise to carry out projects in future applications. The School will provide two types of education programs: credit program and degree program. Students from any NCKU college or non-major undergraduate program can also complete the degree program according to the School's requirements, in addition to the credit program.

The School of Computing at National Cheng Kung University (NCKU) is expected to open in 2020. For more information, please visit the School of Computing website:
http://computing.ncku.edu.tw/index.php?Lang=en

Directions

From Taiwan Taoyuan International Airport (TPE)

1. Take the Metro, taxi or shuttle bus from the Taoyuan International Airport station (Metro A12-14) to Taiwan High Speed Rail (THSR) Taoyuan Station (Metro-A18), which takes about 20 minutes (See the figure below). More information:
https://www.taoyuan-airport.com/english/taoyuan_metro

2. Take the THSR train from Taoyuan Station to "Tainan Station".

3. Take the shuttle train appears every 30 minutes and arrives at Tainan Train Station in about 23 minutes. You can walk from the Tainan Train Station (Rear station) to NCKU.

From Kaohsiung International Airport (KHH)

1. Take Kaohsiung Metro from the Airport Station (Metro-R4) to Zuoying Taiwan High Speed Rail (THSR) (Metro-R16) or Kaohsiung Main Station (Metro-R11) for TRA Train. (See more information:
https://www.kia.gov.tw/english/TransportationEng/TransportEng/KRTCEng.htm)

2. (a) If you take the THSR Train from Zuoying to Tainan Station, the traveling time is about 15 minutes, then you will need to take the shuttle train appears every 30 minutes and arrives at Tainan Train Station in about 23 minutes. You can walk from the Tainan Train Station to NCKU.

(b) If you take the TRA from Kaohsiung Main Station to Tainan TRA Station, which usually takes about 35 minutes on express trains. Then you can walk from the Tainan Train Station (Rear station) to NCKU.

By car From the North

1. Take National Freeway No.1 (Sun Yat-Sen Freeway) southbound.
2. Get off at Exit 324 (Dawan Interchange) and turn right to Xiaodong Road.
3. Drive down Xiaodong Road and cross Sheng-Li Road, you will reach NCKU Kuang-Fu campus in 10 minutes.

(If you drive on National Freeway No.3 Southbound, at Exit 346 (Shinhua System), take National Freeway No.8 Westbound (Exit 6, Tainan System Interchange) to get on National Freeway No.1 Southbound to Exit 324 Dawan Interchange)

By car From the South

1. Take National Freeway No.1 (Sun Yat-Sen Freeway) northbound.
2. Get off at Exit 327 (Tainan Interchange) and turn left to westbound Chungshang Road.
3. Travel on Chungshang Road and continue on Dongmen Road.
4. Make a right turn at either Chang Rung Road or Sheng-Li Road, and travel for about 1.1 km to NCKU.

(If you take National Freeway No.3 Northbound, at Exit 357 (Guanmiao Interchange), take No.86 Expressway westbound (Exit 8, Rende System Interchange) to get on National Freeway No.1 northbound to Exit 327)

NCKU Campus Map

1 KUANG-FU Sports Filed
2 Court
3 Chung Cheng Hall
4 Cheng Kung Hall
5 Student Activity Central
6 Bldg. of Management College
7 KUANG-FU Dormitory
8 Wei-Nong Bldg.
9 Da-Cheng Hall
10 Yung-Ping Bldg.
11 College of Social Science

12 Old Bldg. of Liberal Arts College
13 Banyan Garden
14 Li-Hsien Hall
15 Dept. Bldg. of Environment
16 Dept. Bldg. of Architecture
17 Dept. Bldg. of Urban Planing
18 Hsiu-Chi Bldg.
19 New Bldg. of Liberal Arts College
20 Remains of West Gate
21 Cheng Kung Pond
22 The History Museum
    of the College of Liberal Arts

Contact information

2019 WFC Secretarist

Location:
5th Floor, East Block, Yun-Ping Building,
Kuang-Fu Campus, NCKU
Address: No.1, University Road, Tainan City 701, Taiwan (R.O.C)

+886-6-2757575 ext. 50055
em50055@email.ncku.edu.tw

Hotel Info

ZENDA SUITES

No.2, Dasyue Rd.,East District.
Tainan City 701, Taiwan.
+886-6-275-8999

SHANGRI-LA

89 Section West, University Road,
Tainan 70146 Taiwan
+886-6-702-8888

Railway Info

Taiwan High Speed Rail
+886-2-4066-3000

Tainan Railway Station
+886-6-226-1314

List of Participants

(Arranged in alphabetical order)

Chairs

Burn Lin
Cheng-Wen Wu
Huey-Jen Jenny Su
Jane Yung-Jen Hsu
Jyuo-Min Shyu
Kang-Lung Wang
Lih-Juann Chen
Miin-Chyou Wu
Ming-Der Shieh
Sun-Yuan Hsieh
Tim Cheng
Yu-Chong Tai

Keynote Speakers

Wen-Hann Wang
Yike Guo

Speakers

Adam Lee
Chia-Liang Kao
Chia-Lin Yang
Chi-Chuan Hwang
Darsen Lu
Ethan Tu
Hiroshi Nakamura
Jenn-Jier James Lien
Jerry Chou
Jiaxin Yu
Keh-Chung Wang
Lee-Feng Chien
Li-C. Wang

Min Sun
Naoya Iwamoto
Shawn Blanton
Shih-Hao Hung
Shih-Wei Liao
Shyh-Nan Liou
Tom Liang
Tzi-Cker Chiueh
Tzuu-Hseng S. Li
Wen-Sheng Feng
Winston Hsu
Yi-Hsuan Yang
Ying-Ching Eric Yang
Yung-Nien Sun

Distinguished Guests

Yoshio Aso
Chi-Yuan Chin
Chung-Laung Liu
Hidetoshi Akiyama
Jang-Yang Chang
Joshua Tzeng
Pei-Zen Chang
Taysheng Jeng
Wei-Chou Hsu
Wen-Yu Su
Yi-Jen Chan
Yukinori Misaki