

Machine Learning for Analytics Architecture: AI to Design AI

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Place: AG710, The Hong Kong Polytechnic University



Recently, lean or lightweight AI, in real world applications ranging from cloud to edge, has witnessed transformative realizations and hence gained significant attention and popularity. Researchers and engineers from both academia and industry have thus been addressing the CHALLENGES in harnessing the prowess unleashed by AI. These exploration of new disruptive OPPORTUNITIES include flexible deployment of **low-complexity** AI algorithms onto **high performance** computing platforms with **high accuracy** and **high-energy efficiency**.

As such, based on the vertical integration design methodology this talk addresses how lightweight algorithms, based on **software/hardware co-design** and **algorithm/architecture co-design** (AAC) are mapped onto embedded systems or System-on-Chip (SoC) in AI. When crossing or traversing design spaces from algorithmic functionality to potentially synthesizable microarchitecture designs, **algorithmic intrinsic complexity measures** are characterized by potential computing in parallel, efficient data storage and data transfer rate. These **platform independent** features are extracted from different dataflow models using graph theory-based analytics algorithm, during joint exploration of algorithm and architecture co-design space. In this cross-level-of abstraction topic discussion, a case study in high level synthesis is introduced. In addition, a lightweight mobile edge AI for skin cancer detection with two layers CNN at 97% recognition rate, using limited training data, will also be discussed.

Speaker Biography: Chris Gwo Giun Lee is an investigator in signal processing systems for multimedia and bioinformatics. His work on analytics of algorithm concurrently with architecture, Algorithm/Architecture Co-Design (AAC), has made possible accurate and efficient computations on SoC, cloud and edge including Digital Health. He is currently using AI to Design AI and is also enabling accessible health and wellness via AI Humanity.

Chris' work has contributed to 130+ original research and technical publications with the invention of 50+ patents worldwide. His AAC work was used by the industry in deploying more than 60 million LCD panels worldwide. Two of these patents were also licensed by US health industry for development of analytics platform based precision medicine products (Boston, MA, June 1, 2015, GLOBE NEWSWIRE). Chris' AAC work has also been pivotal in delivering feasible and realistic international standards, including 3D extension of HEVC and Reconfigurable Video Coding in ISO/IEC/MPEG, for applications requiring processing of big multimedia data. His low-complexity 3D video coding technology was also included in MPEG.

Chris worked for Philips Semiconductor as a system architect and project leader in the Silicon Valley. He was recruited to National Cheng Kung University in 2003. He has been conducting multidisciplinary research having collaborations with: IBM TJ Watson Research Center on Cloud/Reconfigurable Computing; Banner Alzheimer Institute on Intelligent Health; National Center for High-performance Computing, National Research Laboratory, Taiwan on medical image Analytics; National Taiwan University on Harmonically Generated Microscopy Medical Image Processing; and National Cheng Kung University Medical Center, Kaohsiung Medical University Center, National Cheng Kung University Medical Center and affiliates on telehealth. He worked with Google on Silicon AI and worked with Cadence on High Level Synthesis. Chris is working with MediaTek on Algorithm/Architecture Co-Exploration of Lightweight Transformer on Edge AI.

Chris received his B.S. degree in electrical engineering from National Taiwan University, and M.S. and Ph.D. degrees in electrical engineering from the University of Massachusetts. He served as the AE for IEEE TSP (2016 ~ 2020) and Journal of Signal Processing Systems from 2010 till now. He was formerly the AE for IEEE TCSVT (2009 ~ 2014) for which he received the Best Associate Editor's Award in 2011. Chris is the IEEE CASS Distinguished Lecturer from 2019 to 2021. Having served as ExCom Member for IEEE Region 10 starting 2017, he also chaired the Industry Relations Committee from 2019 to 2020.

Chris served as APSIPA's Deputy VP of IRD from 2020 to 2021, Special Session Co-Chair, APSIPA 2018, TPC Co-Chair, APSIPA 2017, and Chair for APSIPA SPS-TC from 2015-2016 with establishment of sub-committees. He also established APSIPA Taiwan Chapter since May 2020. Chris is the VP of Industry Relations Development in APSIPA since 2024. He is also chairing the Awards Recognition Committee in IEEE Region 10 since 2025. Chris is the founder and CTO for CogniNU Technologies on Digital Health.



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