



SmartGIFT

# 9<sup>th</sup> EAI International Conference on Smart Grid and Innovative Frontiers in Telecommunications

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9–10 December 2024

Hong Kong SAR, China



THE HONG KONG  
POLYTECHNIC UNIVERSITY  
香港理工大學

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Program  
2024

HJ304

The Hong Kong  
Polytechnic University  
Hung Hom, Kowloon

# Program

EAI SmartGIFT 2024

December 9 – 10, 2024

Hong Kong

## **December 9, 2024 (Monday):**

- 08:30 AM - 09:30 AM Registration
- 09:30 AM - 09:45 AM Opening Ceremony
- 09:45 AM - 10:30 AM Keynote Speech: Prof. F. C.-M. Lau
- 10:30 AM - 11:00 AM Coffee & Tea Break
- 11:00 AM - 12: 30 PM Technical Session 1 (Author presentations)
- 12:30 PM - 02:00 PM Lunch (UGreen, 5/F, Communal Building)
- 02:00 PM - 03:30 PM Technical Session 2 (Author presentations)
- 03:30 PM - 04:00 PM Coffee & Tea Break
- 04:00 PM - 05:30 PM Technical Session 3 (Author presentations)
- 06:30 PM – 09:00 PM Gala Dinner

(Nanhai No.1, 30/F, iSQUARE, 63 Nathan Road, Tsim Sha Tsui)

## **December 10, 2024 (Tuesday):**

- 09:15 AM - 10:00 AM Keynote Speech: Prof. S. C. Liew
- 10:00 AM - 10:30 AM Coffee & Tea Break
- 10:30 AM - 12: 00 PM Technical Session 4 (Author presentations)
- 12:00 PM - 01:30 PM Lunch (Ju Yin House, 4/F, Communal Building)
- 01:30 PM - 03:00 PM Technical Session 5 (Author presentations)
- 03:00 PM - 03:30 PM Coffee & Tea Break
- 03:30 PM - 05:00 PM Technical Session 6 (Author presentations)
- 05:00 PM - 05:30 PM Award Presentation and Closing Ceremony

## Joint Source-Channel Coding Systems based on Double-Protograph Low-Density Parity-Check Codes



Prof. Francis C. M. Lau

Associate Dean (Global Engagement), Faculty of Engineering  
Professor, Department of Electrical and Electronic Engineering  
The Hong Kong Polytechnic University

### Abstract

Designing source code and channel code separately is optimal when the code length is very long. For application scenarios requiring short to moderate code lengths, designing source code and channel code jointly can provide a higher coding gain. The main idea of jointly designing source-channel code (JSCC) is to exploit the residual redundancy of the source in the tandem joint source-channel encoding/decoding algorithms so as to achieve coding gains. In this talk, we will present the architecture, encoding/decoding mechanism and performance of various JSCC systems based on protograph low-density parity-check codes. Finally, we will show some hardware implementation results and some future research directions.

### About the Speaker

Prof. Francis C. M. Lau received the BEng(Hons) degree in electrical and electronic engineering and the PhD degree from King's College London, University of London, UK. He is the Associate Dean (Global Engagement) of the Faculty of Engineering and a Professor with the Department of Electrical and Electronic Engineering, The Hong Kong Polytechnic University, Hong Kong SAR. He is also a Fellow of IEEE and a Fellow of IET. He is a co-author of two research monographs and a co-holder of six US and four Chinese patents. He has published more than 360 papers. His main research interests include channel coding, cooperative networks, wireless sensor networks, chaos-based digital communications, applications of complex-network theories, and wireless communications.

He led several collaborative research projects from Huawei and consultancy projects from the Hong Kong SAR Government. He is a co-recipient of one Natural Science Award from the Guangdong Provincial Government, China; one Natural Science Award from the Chinese Institute of Electronics; eight best/outstanding conference paper awards; one technology transfer award; two young scientist awards from International Union of Radio Science; and one FPGA design competition award. He is among world's top 2% scientists in 2020, 2021 and 2022 according to the metrics compiled by Stanford University.

He was the General Co-chair of International Symposium on Turbo Codes & Iterative Information Processing (2018) and the Chair of Technical Committee on Nonlinear Circuits and Systems, IEEE Circuits and Systems Society (2012-13). He served as an associate editor for IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS II (2004-2005 and 2015-2019), IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS I (2006-2007), and IEEE CIRCUITS AND SYSTEMS MAGAZINE (2012-2015). He has been a guest associate editor of INTERNATIONAL JOURNAL AND BIFURCATION AND CHAOS since 2010.

## From Wireless Network Research to LLMind: Integrating Generative AI, IoT, and Human Intelligence for Superintelligent Systems



Prof. Soung Chang Liew

Choh-Ming Li Professor of Information Engineering  
Co-Director of the Institute of Network Coding  
The Chinese University of Hong Kong

### Abstract

In this talk, I will present my belief that academic wireless communications research can benefit greatly from an increased focus on the experimental work and prototyping. I will highlight how healthy synergistic and check-and-balance interactions between theoreticians and experimentalists can lead to more effective scientific pursuits. To illustrate this, I will present several works from my group that exemplify the iterative process of building experimental prototypes to inspire new theories and vice versa. These examples include a project to build an optical ether fabric to circumvent the bottleneck and enhance the coverage of optical wireless networks, and a project for vertical integration of wireless networks and robotic mobiles to improve end-to-end performance gain.

Building wireless systems with a focus on practical applications has inspired us to explore the intersection of Generative AI and wireless networks for creating even more powerful solutions. This effort culminated in our latest venture, LLMind, a framework that leverages Generative AI and Large Language Models (LLMs) to orchestrate complex, multi-component tasks. LLMind aspires to unify human intelligence, artificial intelligence, IoT, and high-performance networking into a cohesive "superintelligent" system, seamlessly integrating advancements in computation and communication into a singular, transformative technology.

### About the Speaker

Professor Soung Liew is Choh-Ming Li Professor of Information Engineering at the Chinese University of HK (CUHK). He received his B.S., M.S., and Ph.D. degrees from the Massachusetts Institute of Technology (MIT). During his time at the MIT Laboratory for Information and Decision Systems, he conducted fundamental research on Fiber-Optic Communications Networks from 1984 to 1988. Following that, he joined Bellcore in New Jersey, where he worked on Broadband Network Research from March 1988 to July 1993. Since 1993, Professor Liew has been a Professor in the Department of Information Engineering at the Chinese University of Hong Kong (CUHK), where he has held many leadership positions such as Department Chairman from 2006 to 2009, Associate Dean of Engineering (Research) from 2004 to 2006, and Co-Director of the Institute of Network Coding from 2014 to the present day. In recognition of his commitment to teaching excellence, Professor Liew received the first CUHK Vice Chancellor's Exemplary Teaching Award in 2000. Professor Liew's research interests revolve around wireless networks, Internet protocols, and blockchain, with a current focus on the impact of AI in these fields. His group's original paper on physical-layer network coding was recognized by Google Scholar as one of the ten classic papers in Computer Networks and Wireless Communications in 2017. Professor Liew is a Fellow of IEEE, IET, HKIE, and the Hong Kong Academy of Engineering.

## **Session 1. Smart Grid and Energy Systems**

**Dec 9 11:00 AM - 12:30 PM**

**Session Chair: Dr. Junwei Liu**

### **Enhancing Smart Grid Resilience and Efficiency: The Role of Large Language Models in Cybersecurity and System Management**

Li, Jinze (The University of Hong Kong); Xu, Jinfeng (The University of Hong Kong); Yang, Shuo (The University of Hong Kong); Ngai, Edith (The University of Hong Kong)

### **Mapping Optimal Space Simplification Analysis in Triple Phase Shift Control of Dual Active Bridge Converters**

Xu, Wenjie (The Hong Kong Polytechnic University); Liu, Junwei (The Hong Kong Polytechnic University); Xu, Wenzheng (Beijing Jiaotong University); Wang, Yixin (Beijing Jiaotong University); Chen, Taiming (The Hong Kong Polytechnic University)

### **Modelling of a Vibration based Kinetic Energy Harvester for Condition Monitoring and Fault Prediction in HVDC Systems**

He, Qinwei (Global Energy Interconnection Research Institute Europe GmbH); Lan, Tian (Global Energy Interconnection Research Institute Europe GmbH); van den Bos, Chris (Systematic Design B.V.); Li, Peng (State Grid Jibei Electric Power Co., Ltd); Visee, Richard (Systematic Design B.V.)

### **Dual-attention Fusion Transformer for Electricity Theft Detection to Secure Smart Grids**

Guo, Cai (School of Science and Technology, Hong Kong Metropolitan University); Tao, Bishenghui (School of Science and Technology, Hong Kong Metropolitan University); Dai, Hong-Ning (Department of Computer Science, Hong Kong Baptist University)

### **Multi-Objective Optimization of Energy Storage Capacity Using Non-Dominated Sorting Artificial Cooperative Search and Composite Weighted TOPSIS**

Ye, Xiao (China Energy Engineering Group Anhui Electric Power Design Institute Co., Ltd.); Li, Anping (Huaihe Energy Power Group Co., Ltd.); Mu, Feng (China Energy Engineering Group Anhui Electric Power Design Institute Co., Ltd.); Chen, Xiaofeng (China Energy Engineering Group Anhui Electric Power Design Institute Co., Ltd.); Li, Shilei (Hefei University of Technology); Yang, Jingyao (Hefei University of Technology); Yang, Liguang (Hefei University of Technology); Li, Hongmei (Hefei University of Technology)

## **Session 2. Vehicular Networks and ITS**

**Dec 9 02:00 PM - 03:30 PM**

**Session Chair: Dr. K. F. Chu**

### **Development of a Cost-Effective V2X Test-Bed to Study the Characteristics of Vehicular Networks**

Dissanayake, Manoj Bandara (Department of Electrical and Information Engineering, University of Ruhuna, Sri Lanka); Indrasiri, Shamika Lakshan (Department of Electrical and Information Engineering, University of Ruhuna, Sri Lanka); Dematawaarachchi, Hasini Prabodhika (Department of Electrical and Information Engineering, University of Ruhuna, Sri Lanka); Kalupahana Liyanage, Kushan Sudheera (Department of Electrical and Information Engineering, University of Ruhuna, Sri Lanka); Chong, Peter Han Joo (Department of Electrical and Electronic Engineering, Auckland University of Technology, New Zealand)

### **Federated Learning-based Channel Estimation in Vehicular Networks**

Ding, Cao (The Hong Kong Polytechnic University); Ho, Ivan (The Hong Kong Polytechnic University)

### **Deep Q-network based intelligent traffic signal control: case study of a large single intersection using SUMO**

Wang, Wanshu (The University of Tokyo); Wang, Zheng (Swinburne University of Technology); Yang, Bo (Kyushu Institute of Technology); Nakano, Kimihiko (The University of Tokyo)

### **DCA-YOLO: Non-Prominent Feature Object Detection Using the Dynamic Convolution Attention YOLO Model**

Li, Yang (City University of Hong Kong); Yang, Xiaolong (BEIHANG UNIVERSITY); Hei, Yuekun (BEIHANG UNIVERSITY); Duan, Xuting (BEIHANG UNIVERSITY)

### **A Cross-Layer Congestion-Aware Routing Protocol for UAV-Aided VANETs with Enhanced Line-of-Sight Communication**

Priyadarshini, Prangya (National Institute of Technology, Rourkela); Hota, Lopamudra (National Institute of Technology, Rourkela); Kumar, Arun (National Institute of Technology, Rourkela); Chong, Peter Han Joo (Auckland University of Technology, New Zealand)

### **Railway Power Management by the Optimization of Driving Strategies for a fleet of Trains (Invited Presentation)**

Zhuang, Xiao (The Hong Kong Polytechnic University); Ye, Hongbo (The Hong Kong Polytechnic University); Chung, Edward (The Hong Kong Polytechnic University)

## **Session 3. Communication Technologies I**

**Dec 9 04:00 PM - 05:30 PM**

**Session Chair: Dr. Yuyi Mao**

### **Pointing Errors Analysis for Inter-Satellite MRR PNC System**

Zhang, Hangfei (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences); Guo, Audrey Christine (Alabama School of Fine Arts); Lu, Lu (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences); Jia, Yanmei (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences)

### **Hy-LiRF: Hybrid LiFi and WiFi Network Supporting Seamless Real-Time Transmissions**

Li, Menghan (University of Chinese Academy of Sciences); Zhang, Runxin (University of Chinese Academy of Sciences); Zhang, Yuheng (University of Chinese Academy of Sciences); Gong, Yongsheng (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences); He, Jianhua (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences); Lu, Lu (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences)

### **UAVs-Enabled Maritime Communications: Control Barrier Functions for Physical Secure Systems**

Yu, Zhitao (Guangzhou Institute of Technology, Xidian University); Shu, Wake (Guangzhou Institute of Technology, Xidian University); Guo, Xuanzhi (Guangzhou Institute of Technology, Xidian University); Mao, Liang (Shenzhen Polytechnic University); Niu, Guanchong (Guangzhou Institute of Technology, Xidian University); Pun, Man-On (The Chinese University of Hong Kong, Shenzhen); Cheng, Zhiming (China Academy of Telecommunications Technology)

### **A Low-Complexity and High-Performance K-best GFSK MSDD with LLRs Outputs**

Zhu, Jiajun (The Hong Kong Polytechnic University); Lau, Francis (The Hong Kong Polytechnic University)

### **Introduction of Direction of Arrival (DOA) Indoor and Outdoor Navigation Based on Machine Learning**

Liu, Tong (The Hong Kong Polytechnic University); Lin, Wei (The Hong Kong Polytechnic University)

### **Automatic Preamble Extraction System for LPWAN Signal**

Kong, Chun Ho (The Hong Kong Polytechnic University, Hong Kong); Hu, Haibo (The Hong Kong Polytechnic University, Hong Kong)

## **Session 4. AI and Information Security**

**Dec 10 10:30 AM - 12:00 PM**

**Session Chair: Dr. Bishenghui Tao**

### **An Automated Smart Contract Framework for NFT-based Warranty Management System with Account Abstraction**

Chaini, Sai Sambhab (NIT Rourkela); Hota, Lopamudra (NIT Rourkela); Kumar, Arun (NIT Rourkela); Chong, Peter Han Joo (Auckland University of Technology, New Zealand)

### **LTTS-GAN: A Long-term Time Series Generative Adversarial Network**

Cui, Xiangyu (The Chinese University of Hong Kong, Shenzhen); MA, Xianping (The Chinese University of Hong Kong, Shenzhen); PUN, Simon (The Chinese University of Hong Kong, Shenzhen); Cheng, Zhimin (China Academy of Telecommunications Technology)

### **A Lightweight Encrypted JPEG Image Retrieval Model Based on Self-Attention Networks**

Chen, Yanfeng (Jinan University); Liang, Jing (Jinan University); Li, Peiya (Jinan University)

### **Local-channel Large Separable Kernel Attention (Online Presentation)**

Cui, Haixia (South China Normal University); Deng, Zengjie (South China Normal University); Lei, Tao (South China Normal University)

### **FLTP: A Fast and Low-bandwidth Transaction Propagation Protocol in Ethereum**

Ma, Deen (Shenzhen University); Zhao, Chonghe (Shenzhen University); Zhang, Shengli (Shenzhen University); Wang, Taotao (Shenzhen University); Yang, Qing (Shenzhen University)



## **Session 5. Communication Technologies II**

**Dec 10 01:30 PM - 03:00 PM**

**Session Chair: Dr. Yuyi Mao**

### **Automated Topology Exploration and Design of Passive Microstrip Filters Based on Grid-like Topology**

Bi, Jingyun (The Hong Kong Polytechnic University); Zhou, Xinyu (The Hong Kong Polytechnic University)

### **Physical Layer Security for Omni-DRIS Enhanced Visible Light Communications**

Liu, Mengda (University of Chinese Academy of Sciences); Xie, Xinyan (University of Chinese Academy of Sciences); Shen, Defan (University of Chinese Academy of Sciences); He, Jianhua (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences); Jia, Yanmei (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences); Lu, Lu (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences)

### **A Hybrid Topological Heterostructure For Communication**

Zhang, Xinyu (The Hong Kong Polytechnic University); Li, Yueyao (The Hong Kong Polytechnic University); Li, Sijie (The Hong Kong Polytechnic University); Chen, Menglin L.N. (The Hong Kong Polytechnic University)

### **Zero-Shot Learning-based Maritime Semantic Communication System**

Hou, Lanxiang (Guangzhou Institute of Technology, Xidian University); Sun, Jiayi (Guangzhou Institute of Technology, Xidian University); Liang, Haoqi (Guangzhou Institute of Technology, Xidian University); Mao, Liang (Shenzhen Polytechnic University); Niu, Guanchong (Guangzhou Institute of Technology, Xidian University); Pun, Man-On (The Chinese University of Hong Kong, Shenzhen); Cheng, Zhiming (China Academy of Telecommunications Technology)

### **Rate Optimization for Visible Light Communications Using Asymmetric Bridged-T Pre-equalizer**

Tian, Hwei (University of Chinese Academy of Sciences); Zhang, Runxin (University of Chinese Academy of Sciences); Xiong, Jian (University of Chinese Academy of Sciences); He, Jianhua (Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences); Lu, Lu (University of Chinese Academy of Sciences)

## **Session 6. Autonomous and Electric Vehicles**

**Dec 10 03:30 PM - 05:00 PM**

**Session Chair: Dr. Rui Song**

### **Mixed-Autonomy Traffic and Wireless Charging Problem for Autonomous Electric Vehicles Using Reinforcement Learning**

Chu, Kai-Fung (University of Cambridge); Xie, Yue (University of Cambridge); Lam, Albert (Fano Labs); Iida, Fumiya (University of Cambridge)

### **A Review of Digital Twins for Electric Vehicles**

Zhou, Yangyang (The Hong Kong Polytechnic University); Huang, Chao (The Hong Kong Polytechnic University)

### **Optimization of Orderly Charging Strategy of Electric Vehicles Based on GWO Algorithm (Online Presentation)**

Yan, Shaokui (State Grid Ningxia Metrology Center)

### **Optimized Global Path Planning Based on Terrain Traversability Analysis by Plane Fitting Approach**

Ren, Ruiqi (Nankai University); Zhang, Zheng (Nankai University)

### **GMLO: Ground and Memory Optimized LiDAR Odometry**

Fang, Kaiduo (The Hong Kong Polytechnic University); Song, Rui (The Hong Kong Polytechnic University)

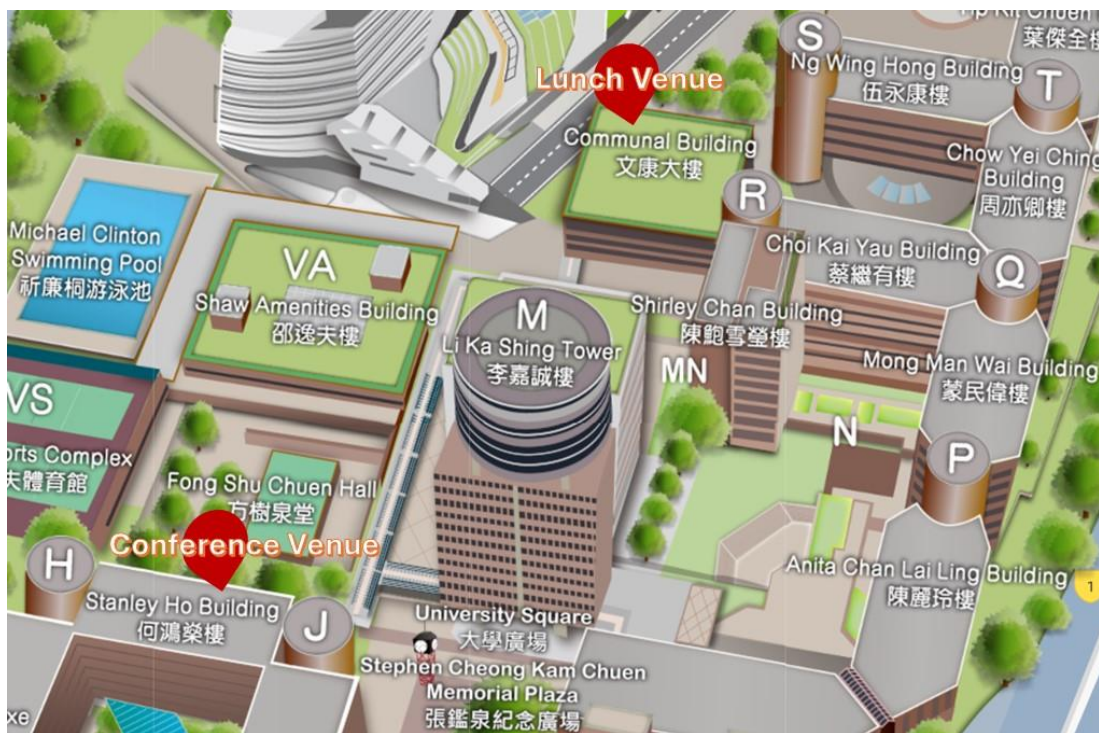
# Useful Information

For on-site support or assistance, please contact our local conference manager, Momentous Asia, at 6368 4597 (Tel/WhatsApp) or dorislam@momentousasia.com.

For Internet access, you may connect to “**Wi-Fi.HK via PolyU**”.

Login ID and Password are not required. (2 hours per session free Wi-Fi access. Need to re-connect after 2 hours connection time.)

Campus Map: <https://www.polyu.edu.hk/campus-map/>



**Lunch** will take place at Communal Building, PolyU

Dec 9 12:30 pm: UGreen, 5/F

Dec 10 12:00 pm: Ju Yin House, 4/F

**Gala Dinner** will take place at **Nanhai No.1 (南海一號)** on Dec 9 6:30 pm

Address: 30/F, iSQUARE, 63 Nathan Road, Tsim Sha Tsui

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