Topic 1

Hybrid Quantum-Classic Computing for Future Network Optimization and Machine Learning

12 Dec. 2025（Fri.）
10:00~10:40
Engineering Building D
(ED108), NYCU

Speaker： Prof. Zhu Han

- Houston, TX, United States
- ACM Distinguished Lecture
- IEEE/AAAS Fellow

Please scan QR code for more information

Host：Prof. Li-Chun Wang NYCU

【Abstract】

Benefited from the technology development of controlling quantum particles and constructing quantum hardware, quantum computation has attracted more and more attention in recent years. This talk will give an introduction of quantum computing and its applications in network optimization. We first introduce the basics of quantum computing and what quantum parallelism is. Second, we will discuss the adiabatic quantum computing math model and one real implementation, Quadratic Unconstrained Binary Optimization (QUBO) on D-wave quantum annealer. Then we propose a hybrid quantum Benders' decomposition algorithm for joint quantum and classic CPU/GPU computing. Finally, we will discuss how our proposed framework can be employed in 6G network optimization, smart grid, and machine learning, as well as other quantum techniques such as Quantum Approximate Optimization Algorithm (QAOA).

【Bio】

Zhu Han received the B.S. degree in electronic engineering from Tsinghua University, in 1997, and the M.S. and Ph.D. degrees in electrical and computer engineering from the University of Maryland, College Park, in 1999 and 2003, respectively. From 2000 to 2002, he was an R&D Engineer of JDSU, Germantown, Maryland. From 2003 to 2006, he was a Research Associate at the University of Maryland. From 2006 to 2008, he was an assistant professor at Boise State University, Idaho. Currently, he is a John and Rebecca Moores Professor in the Electrical and Computer Engineering Department as well as the Computer Science Department at the University of Houston, Texas. Dr. Han is an NSF CAREER award recipient of 2010, and the winner of the 2021 IEEE Kiyo Tomiyasu Award (an IEEE Field Award). He has been an IEEE fellow since 2014, an AAAS fellow since 2020, and ACM fellow since 2024. He is an IEEE Distinguished Lecturer from 2015 to 2018, and an ACM Distinguished Speaker from 2022-2025. Dr. Han is also a 1% highly cited researcher since 2017.

| Organizers |

Topic 2

Qubit Allocation, Entanglement Routing, and Topology Optimization for Quantum Networks and Computing

12 Dec. 2025（Fri.）
10:40~11:20
Engineering Building D
(ED108), NYCU

Speaker：

Prof. Zhu Han

- Houston, TX, United States
- ACM Distinguished Lecture
- IEEE/AAAS Fellow

Host：Prof. Li-Chun Wang NYCU

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【Abstract】

Recent advances in quantum networking are reshaping how we envision secure communication and distributed quantum computation. This talk presents a series of projects that connect quantum communication and distributed quantum computing, focusing on how to build scalable, high-fidelity, and resource-efficient quantum infrastructures. First, we introduce satellite-based quantum networks. By combining quantum and classical computing, we design hybrid optimization frameworks that improve satellite assignment, resource allocation, and entanglement routing across integrated space–terrestrial systems. These quantum-assisted algorithms show how emerging quantum optimizers can accelerate large-scale network planning for the future quantum Internet. Building upon this foundation, we then explore satellite–aerial–terrestrial quantum networks (SATQNs). Here, we study how satellites, aerial vehicles, and ground stations can cooperate to distribute entanglement efficiently. We develop a decomposition-based optimization method that jointly selects routing paths and adjusts entanglement generation rates. This approach increases throughput and fidelity while coping with dynamic and noisy environments. Finally, the talk extends these principles into distributed quantum computing (DQC). We introduce a co-design framework for network topology and qubit allocation that minimizes communication overhead among quantum processing units (QPUs). This work explicitly models entanglement routing within the optimization process, enabling execution of large quantum circuits across interconnected QPUs. Together, these works form a unified vision that connects quantum communication, optimization theory, and distributed computing, toward realizing scalable distributed quantum computing and intelligent quantum networks capable of supporting next-generation applications, such as quantum AI, cryptography, and global secure computation.

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