Newsletter issue 18-2026, May 3, 2026
AI and Quantum Research Center (AIQRC), Asia University, Taiwan

Activities

[1] **2026/6/29** (coming soon) - INTERNATIONAL SYMPOSIUM ON QUANTUM AI & THE FUTURE OF LIFE (ISQAI-FoL)

The International Symposium on Quantum AI and the Future of Life aims to create an interdisciplinary platform for thought leaders, practitioners, and researchers from diverse fields to explore the transformative potential of quantum computing and artificial intelligence (AI) in shaping the future of human well-being. This event will focus on cutting-edge applications of these groundbreaking technologies across four key domains: Biomedicine & Healthcare, Integrating Traditional Chinese Medicine and Western Medicine, Longevity and Anti-aging, and Life Optimization.

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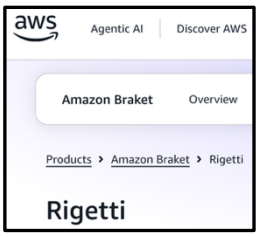
[2] **On April 22, 2026,** AIQRC published an article in the Economic Daily News; the English translation is included in the newsletter. Click here for the original contents.

[3] **On April 8, 2026** AIQRC received approval to use the AWS cloud-based Rigetti Computing quantum computing system.



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[4] **Feb. 2026** - We recently secured approval for five Ministry of Education–funded programs in Taiwan, creating valuable learning pathways for young people. These programs support international exchange and advanced training at globally recognized universities, helping students build interdisciplinary knowledge, research skills, and global perspectives in fields such as artificial intelligence, quantum computing, biomedical science, systems medicine, and robotics.

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I-9-10		IBM量子夢：紐約研習營	美國紐約	(九)科技網絡及數位服務	制霸IBM量子科技巔峰	115年7月13日至7月28日，共計16日（含飛行日）
I-9-11		醫工量子：UCLA菁英計畫	美國加州洛杉磯	(九)科技網絡及數位服務	探索腦科學與量子計算	115年7月6日至9月3日，共計60日（含飛行日）
I-9-12		量子金融：赴美職涯領航	美國大紐約區	(九)科技網絡及數位服務	跨足量子與AI金融實務	115年7月6日至8月9日，共計35日（含飛行日）
I-9-13		AI與石黑浩：探索擬真界	日本大阪	(九)科技網絡及數位服務	台日共創人形機器人新未來	115年8月1日至116年1月15日，共計168日（含飛行日）
I-9-14		勇闖WVU：太空機器人實戰	美國摩根敦	(九)科技網絡及數位服務	太空採集機器人見習	115年7月6日至7月23日，共計18日（含飛行日）

[5] **From March 16 to 19**, Asia University's AIQRC is actively advancing its forward-looking strategy. President Jeffrey J. P. Tsai, Honorary Chairman of AIQRC (third from the right in the photo) and Chair Professor, K.T. Huang, Director of AIQRC (fifth from the right in the photo), recently led a delegation to the United States to visit quantum technology firm Rigetti Computing, where they were hosted by Vice President Mike Piech (fourth from the right in the photo). The visit marks an important step in strengthening the university's quantum AI strategy, fostering connections with world-class technologies, and building a solid foundation for its vision of becoming an "AI University."

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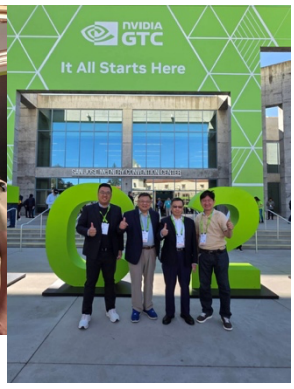
The Asia University delegation conducted an in-depth visit to Rigetti's laboratories, inspecting hardware facilities and system architectures such as superconducting quantum computers (superconducting qubits), and gaining firsthand insight into the latest technological developments shaping the global quantum industry. President Jeffrey J. P. Tsai, Honorary Chairman of AIQRC (third from the left in the photo), Chair Professor, K.T. Huang, Director of AIQRC (second from the right in the photo) and Rigetti Computing Vice President Mike Piech (fourth from the left in the photo).

[6] **From March 16 to 19**, President Jeffrey J. P. Tsai, Honorary Chairman of AIQRC (second from the right in the photo), led teams in quantum AI, robotics, and intelligent healthcare to Silicon Valley to attend NVIDIA GTC 2026, the world's premier annual AI conference, and engage with the global AI and semiconductor ecosystem. Tsai emphasized that the visit aimed not only to track cutting-edge technologies, but also to mark a major milestone in advancing Asia University's AI University vision and international collaboration strategy.



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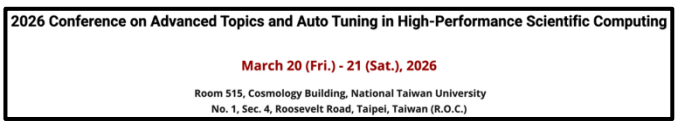
[7] **On March 20, 2026** Deputy Director of AIQRC, Ka-Lok NG, delivered a presentation titled "Exploring the Potential Advantages of Quantum Machine Learning in Biomedical Research" at the 2026 Conference on Advanced Topics and Auto Tuning in High-Performance Scientific Computing.



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[8] **Feb. 2026** - We successfully had a proposal accepted for the Fujitsu Quantum Simulator Challenge 2025–26 event.

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Quantum AI and Multi-Omics Integration for Gene Regulatory Network Discovery

Gene regulatory networks (GRNs) are directed circuits linking transcription factors (TFs, proteins that switch genes on or off), cis-regulatory elements (CREs, DNA sequences such as enhancers where TFs bind), and their downstream target genes — determine cell identity and, when disrupted by genetic variants, drive disease. Variants act locally, altering TF occupancy at nearby CREs, and systemically, where the dysregulated TF propagates consequences to distant genes across chromosomes — for example, variants near immune-regulatory TFs can rewire expression of dozens of downstream immune genes simultaneously. These long-range trans-regulatory effects are mediated not only by TFs but also by cytokines, RNA-binding proteins, and chromatin remodelers depending on tissue context — effects that cis-only analysis often misses.

Resolving this architecture requires three complementary data contexts: bulk multi-omics for genome-scale detection of distant gene associations; single-cell multimode data for cell-type-specific TF–CRE–target relationships that tissue averaging obscures; and spatial transcriptomics for enhancer–gene co-localization within defined tissue niches for example, cells communicating within inflamed tissue microenvironments that dissociation-based profiling destroys. Jointly integrating these modalities improves recovery of disease-associated regulatory variants yet classical methods struggle to scale to the combinatorial complexity of real regulatory networks, particularly under feedback loops and nonlinear TF–CRE interactions [1].

Quantum AI addresses specific bottlenecks as a representation enhancer and optimization heuristic complementary to, not a replacement for existing methods. Quantum kernel methods provide a more flexible way of mapping complex regulatory patterns embedding multi-layer feature vectors into high-dimensional spaces (Hilbert spaces), where nonlinear co-dependencies between regulatory layers become more separable than standard classical approaches allow. Identifying coherent trans-regulatory gene modules maps to a combinatorial optimization problem (QUBO) addressed by the Quantum Approximate Optimization Algorithm, which uses quantum circuit-based search to explore regulatory network configurations more broadly than classical greedy methods without optimality guarantees and currently constrained by hardware noise. These quantum approaches remain largely simulator-based today; genome-scale application is actively developing [2-4].

Together, **quantum-enhanced optimization** and richer feature representations offer a tractable direction for approximating the full cis-to-trans GRN inference problem narrowing the candidate variant–TF–target gene paths most worthy of experimental validation through CRISPR perturbation or eQTL replication, and potentially accelerating discovery of disease-relevant regulatory pathways for precision medicine.

1. Muto, Y., Wilson, P. C., Ledru, N., Wu, H., Dimke, H., Waikar, S. S., & Humphreys, B. D. (2021). Single cell transcriptional and chromatin accessibility profiling redefine

cellular heterogeneity in the adult human kidney. *Nat Commun*, *12*(1), 2190. https://doi.org/10.1038/s41467-021-22368-w

2. Streif, M., & Leib, M. (2019). Comparison of QAOA with quantum and simulated annealing. *arXiv*:1901.01903. https://arxiv.org/abs/1901.01903
3. Streif, M., & Leib, M. (2019). Comparison of QAOA with quantum and simulated annealing. *arXiv*:1901.01903. https://arxiv.org/abs/1901.01903
4. Yazdi, M., Ralpati Srinivas, K., & Yadav, A. (2025). Quantum deep learning pipeline for next generation network biology. *bioRxiv*. https://doi.org/10.1101/2025.10.28.685074

Prepared by
Dr. Eskezeia Y Dessie [1,2]
[1]Indiana University School of Medicine Department of Medicine, Division of Pulmonary, Critical Care, Sleep & Occupational Medicine R3C400, 1101 W 10th Street Indianapolis, IN 46202
Member, AIQRC
Email: edessie@iu.edu | estu2003@gmail.com
Linkedin: https://www.linkedin.com/in/eskezeiadessie/

Edited by
Ka-Lok Ng [2,3]
Distinguish Professor & Deputy Director
[2] AI and Quantum Research Center (AIQRC), Asia University, Taiwan
[3] Department of Bioinformatics and Medical Engineering, Asia University

AI and Quantum Research Center (AIQRC)
Room A110, Asia University, No. 500, LiuFeng Rd., WuFeng Dist., Taichung City 41354 Taiwan.
Email: qphys.qcomp@gmail.com Office: 04-23323456 ext. 6631
Web: https://quantum.asia.edu.tw/