亞洲大學 ASIA UNIVERSITY

QUANTUM

**Newsletter** issue 11-2025, Dec. 20, 2025

AI and Quantum Research Center (AIQRC), Asia University, Taiwan

Activity

[1] 5 Feb. 2026

INTERNATIONAL SYMPOSIUM ON HUMANOID ROBOTICS AND SOVEREIGN AI FOR FUTURE LIVING, Asia University

Click here for more information

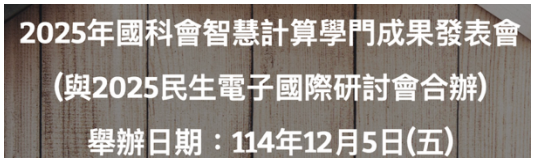

[2] Dec. 13, 2025

Professor Ka-Lok Ng delivered a presentation at the ICSB GIW conference, held at Hong Kong University.

Title: The Rise of Quantum Computing in Biomedical Research


[3] Dec. 9, 2025, Samuel YC Chen, Wells Fargo, USA – Visiting Scholar at AIQRC Center

[4] Dec. 5, 2025, Professor Ka-Lok Ng delivered a presentation at the National Science Council's Smart Computing Research Achievements Meeting & 2025 International Workshop on Consumer Electronics, held in Room A116 at Asia University.




Title: Realizing Quantum Advantage with Quantum Machine Learning for Biomedical Data Classification

[5] Nov. 27, 2025

AIQRC has signed a Memorandum of Understanding (MOU) to partner with a local instrument manufacturer.

## Quantum Computing Applications in Medical Diagnostics: Focused Summary

Quantum computing is increasingly investigated as a potential enabler for next-generation medical diagnostics, driven by the rising complexity of diagnostic data from medical imaging, genomics, and electronic health records. Conventional computing approaches often face limitations in processing speed, scalability, and pattern recognition when analysing large, high-dimensional datasets, prompting interest in quantum-enhanced alternatives.

The reviewed literature places strong emphasis on **quantum machine learning (QML)** for diagnostic tasks. Proposed applications include medical image classification, early disease

detection, biomarker discovery, and AI-assisted clinical decision support. Quantum algorithms are expected to improve feature extraction and optimisation by exploiting high-dimensional quantum state spaces, particularly in imaging and data-intensive diagnostic workflows.

Most practical progress to date involves **hybrid quantum–classical diagnostic models**, where quantum components are integrated into classical AI pipelines to address specific computational bottlenecks, such as optimisation and feature selection. These hybrid approaches are viewed as the most feasible pathway toward near-term diagnostic impact given the current limitations of quantum hardware.

However, diagnostic applications remain largely **experimental and pre-clinical**. Key barriers include limited qubit scalability, hardware noise and error rates, lack of clinically validated benchmarks, and challenges in integrating quantum methods into existing healthcare systems. The review concludes that while quantum computing holds substantial long-term promise for improving diagnostic accuracy and efficiency, significant advances in hardware, algorithms, and clinical validation are required before routine clinical adoption becomes feasible.

Resource: Frontiers in Computer Science. (2025). *Quantum algorithms and complexity in healthcare applications: A systematic review with machine learning-optimized analysis*. **Front. Comput. Sci.**, 7, Article 1584114. https://doi.org/10.3389/fcomp.2025.1584114

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Prepared by
Dr. Wei-Hung Pan[1]
Data Innovation Lead

Edited by
Ka-Lok Ng [2,3]
Distinguish Professor & Vice Director

[1] Sysmex Europe, Hamburg, Germany
[2] Department of Bioinformatics and Medical Engineering, Asia University
[3] AI and Quantum Research Center (AIQRC), Asia University, Taiwan

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/