

Activities

[1] On July 14, 2026

Asia University, AIQRC and Ministry of Education's Taiwan Global Pathfinders Grant Program

1-9-10 IBM Quantum Dream: New York Study Camp, Asia University, AIQRC

Ministry of Education's Taiwan Global Pathfinders Grant Program Launches "IBM Quantum Dream" Initiative, Aiming to Cultivate the Next Generation of "Pi-Shaped" Quantum Talent and Co-create Cross-Disciplinary Applications

July 14 — The successful launch of the inaugural "IBM Quantum Dream" series of events was officially announced today. This program not only aims to introduce cutting-edge quantum computing technology to young students from Taiwan but also embraces a far-reaching strategic goal: to cultivate "Pi-shaped talent" equipped with two areas of deep expertise and broad integration capabilities, in order to jointly design and launch the next generation of the computing revolution. The event unfolded in an atmosphere that blended professional academic inquiry with vibrant enthusiasm, successfully igniting a spark for quantum computing among the new generation.

The atmosphere at the event was described by participants as a gathering of "hidden masters and top experts," with many embarking on the journey with feelings of "anticipation and nervousness." The main visual poster, featuring the striking "IBM Quantum Dream" title, combined IBM's signature blue tones with a deep background, symbolizing IBM's hope to transform complex quantum concepts into easily understandable knowledge to attract a broader youth audience.



Figure 1: The IBM Quantum Dream conference poster

The "Pi-Shaped" Vision: Building Innovative Bridges in the Quantum Era

The core philosophy of this event is to evolve from cultivating "I-shaped talent" (experts in a single field) or "T-shaped talent" (possessing basic collaborative skills) to fostering "Pi-shaped talent." IBM's strategy is that future quantum breakthroughs will occur at the intersection of

different fields. A true "Pi-shaped" quantum talent has a knowledge structure resembling the Greek letter " π ":

- First Vertical Pillar: Core Quantum Skills. This includes a deep understanding of principles like superposition and entanglement, as well as the ability to use open-source tools like Qiskit for quantum programming.
- Second Vertical Pillar: Domain-Specific Expertise. This could be in-depth knowledge in any other professional field, such as chemistry, art, game design, or environmental science.
- The Top Horizontal Bar: Integration and Translation Capabilities. This is the value multiplier for Pi-shaped talent. They can act as "translators," converting the pain points of specific industries into computational problems that quantum computers can solve, and then interpreting the results back into the original domain to create real value.

The goal of the Taiwan Global Pathfinders Grant Program is no longer to cultivate experts in a single field, but to inspire future inventors who can apply quantum technology to any domain. Only such talent can find the "killer applications" for quantum computers and achieve "Quantum Advantage."



Figure 2: A group photo of the nineteen outstanding students from Taiwan

From Abstract Concepts to Fingertip Practice: An Immersive Learn-by-Doing Experience

The "IBM Quantum Dream" event emphasizes a deep learning experience from theory to practice. Through a series of well-designed interactive workshops, abstract quantum concepts are transformed into tangible, hands-on operations.

- Vivid Analogies Lower the Barrier to Entry: To explain counter-intuitive quantum phenomena, experts used many vivid analogies. For instance, a classical bit was compared to a light bulb that can only be "on" or "off," while a qubit is like a "spinning coin" that holds the possibility of being both heads and tails simultaneously before it is observed—this is "superposition." "Entanglement" was likened to a pair of "magic gloves"; no matter how far apart they are, if you know one is a left-hand glove, the other is instantly determined to be a right-hand glove.
- Workshop: Attendees were not just passive listeners but active coders. In an introductory challenge, students learned to use the "Hadamard gate" to put a qubit into a state of superposition. By performing thousands of measurements, they witnessed firsthand the 50/50 probability distribution, intuitively grasping the probabilistic nature

of quantum mechanics. Next, they learned to create a "Bell State," using a "Controlled-NOT (CNOT) gate" to entangle two qubits. They verified from the measurement results that the states of the two qubits were always synchronized, perfectly demonstrating what Einstein called "spooky action at a distance."

- **A Macro Perspective on Frontier Technologies:** In a packed lecture, an expert introduced the audience to the four major quantum computing architectures in the world today: Superconducting Qubits, Trapped Ions, Neutral Atoms, and Silicon Spin Qubits. The lecture not only gave participants a macroscopic view of the entire quantum field's development roadmap but also a deeper understanding of why IBM has chosen the superconducting technology route, which offers advantages in computational speed and scalability.

Unlocking Infinite Possibilities: Cross-Disciplinary Applications of Quantum Computing

The event's lectures painted a compelling vision of the future, showcasing how "Pi-shaped talent" can apply quantum computing to solve humanity's most intractable problems and pioneer entirely new creative fields.

Community Legacy and Outlook

A group photo at the end of the event perfectly captured this spirit: experienced quantum experts stood shoulder-to-shoulder with young students full of potential, symbolizing the cross-generational transmission of valuable knowledge and the spark of intellectual collision. The close proximity and confident smiles of the participants in the photo made it clear that deep friendships and a collaborative spirit had been forged during the event.



Figure 3: An invited speaker introduces the four main architectures of modern quantum computers.



Figure 4: An invited speaker introduces the concept of merging AI models to the students.

One participant said the experience made them deeply reflect on the gap between their own knowledge and the industry's frontier, sparking a strong motivation for continuous learning and new ideas for their future career. This personal journey from challenge to inspiration is the precious takeaway the event hopes to provide for every participant. We hope that the youth of Taiwan can sublimate the inspiration from this event into a reinvention of their own capabilities, playing a key role as bridge-builders in the global quantum ecosystem.

Asia University Hosts International Symposium on Quantum AI and the Future of Life Sciences

Experts Focus on Quantum Chips, AI-Driven Calibration, and Life Science Applications to Shape Future Technology Talent

Asia University hosted the **International Symposium on Quantum Artificial Intelligence and the Future of Life Sciences** on June 29, bringing together leading experts in quantum technology, artificial intelligence, and life sciences from Academia Sinica, Rigetti Computing, Anyon Technologies, D-Wave Quantum, and other organizations. The symposium explored how quantum AI could drive the next wave of breakthroughs in industry, healthcare, and life sciences.



Group photo of distinguished guests, capturing a memorable moment in international exchange on quantum technology and smart healthcare.

As AI models continue to expand in scale, fields such as life sciences, drug discovery, materials simulation, and industrial optimization face unprecedented computational demands. Quantum AI is increasingly viewed as a promising technology capable of overcoming some of the limitations of conventional computing.

A central question raised at the symposium was: **When will the first truly practical, fault-tolerant quantum computer for large-scale commercial applications become a reality?** According to industry roadmaps from companies such as IBM and Google, the first wave of applications demonstrating “quantum advantage” may emerge within the next few years. IBM has identified **2029** as a key target year for delivering a large-scale fault-tolerant quantum computer.

Quantum Computing and AI: A New Computing Ecosystem

Asia University President **Prof. Jeffrey J.P. Tsai** emphasized that artificial intelligence is rapidly transforming higher education, healthcare, and industrial innovation, while quantum computing is regarded as the next-generation technology capable of surpassing some of the limits of traditional computers. He noted that Taiwan, already a global semiconductor powerhouse, has the opportunity to play an important role in quantum chip development, software platforms, system integration, and talent cultivation.



President Jeffrey J.P. Tsai delivered opening remarks, highlighting the role of Quantum AI in strengthening global academia-industry collaboration.

President Tsai highlighted that AI and quantum computing are not independent technologies but rather mutually reinforcing components of a new computing ecosystem. AI can assist with quantum system calibration, optimization, and automation, while scalable fault-tolerant quantum computing could eventually accelerate drug development, materials simulation, optimization problems, and complex probabilistic modeling. He also expressed Asia University's commitment to cultivating future quantum engineers and interdisciplinary innovators through its AI and Quantum Research Center.

AI-Driven Automation for Quantum Computing

Dr. **Chii-Dong Chen**, Distinguished Research Fellow at Academia Sinica and Executive Director of the Quantum Computer Project, delivered a keynote address titled **“Building and Scaling Superconducting Quantum Computing: QPU Engineering and AI-Driven Automation.”** He discussed the development of superconducting quantum chips, fabrication processes, packaging technologies, and the evolution from single-qubit to multi-qubit quantum processors.

Dr. Chen explained that the key challenge in making quantum computers practical is not merely creating qubits, but ensuring that large numbers of qubits can operate reliably and maintain computational quality. He also presented recent progress in using AI agents to automate qubit calibration. These AI systems can coordinate knowledge extraction, parameter optimization, and experimental control, automatically interpreting measurement results and adjusting physical parameters. Such automation may significantly reduce calibration time and help transform quantum computing from laboratory research into scalable engineering platforms.

Industry Perspectives on Quantum Computing

A panel discussion moderated by **Academician Kang L. Wang** of Academia Sinica and UCLA featured Dr. Chen, **Subodh Kulkarni**, President and CEO of Rigetti Computing, and **Jie (Roger) Luo**, Co-founder and CEO of Anyon Technologies. The panelists emphasized that future challenges extend beyond semiconductor fabrication and include cryogenic packaging, control circuitry, alternatives to coaxial cabling, system stability, and integration with data centers.



During the expert panel, speakers engaged in in-depth discussions on quantum computing infrastructure and hybrid architecture development pathways.

Kulkarni noted that superconducting quantum computers offer advantages in speed and manufacturability, but significant hurdles remain regarding error rates, calibration time, and system consistency. He observed that AI and machine learning technologies have already shortened startup and calibration processes from days or even weeks to just a few hours, demonstrating AI's growing role in quantum engineering.

Luo added that multiple quantum computing platforms—including superconducting systems, trapped ions, neutral atoms, and photonics—may coexist in the future, each serving different application scenarios rather than producing a single dominant technology.

Quantum AI for Brain Science and Healthcare

In the afternoon session, **Academician Ann-Shyn Chiang**, President of China Medical University, delivered a keynote presentation titled **“Progress in Mapping the Human Connectome.”** He discussed advances in neuroscience and brain mapping, highlighting how AI, data science, and biomedical research are converging to deepen understanding of the human brain and enable future medical innovations.

Experts at the symposium also explored how quantum AI could benefit life sciences and intelligent healthcare. Applications discussed included drug discovery, protein folding, molecular simulation, and the study of complex diseases. Participants noted that combining

quantum computing with AI could significantly shorten drug screening and simulation timelines while improving precision medicine and healthy aging research.

Cultivating Future Talent

Students and attendees actively engaged with speakers regarding career paths and educational preparation in the era of AI and quantum technologies. Experts encouraged young people from diverse academic backgrounds—including physics, computer science, engineering, medicine, materials science, and management—to participate in the emerging quantum ecosystem. They emphasized that individuals who can effectively use AI tools, understand complex problems, and develop specialized expertise will find opportunities in the rapidly evolving technology landscape.

Prof. **Kuang-Tsai Huang**, Director of Asia University's AI and Quantum Research Center, remarked that the deep integration of quantum computing and AI is laying the foundation for next-generation computing power. He believes that effective integration of these technologies will open new opportunities in smart healthcare, precision medicine, fintech, materials science, and industrial optimization.

President Tsai concluded that Asia University has actively expanded its initiatives in AI, smart healthcare, and quantum technology, while strengthening collaborations with international quantum companies such as Rigetti Computing, Anyon Technologies, and D-Wave Quantum. Through this symposium, the university aims to connect with global technological leaders, cultivate interdisciplinary talent, and contribute to the development of Taiwan's quantum AI ecosystem

Click [here](#) for more details.

The Quantum Bench: Ideas for a research briefing for the Quantum Machine Learning, which translating QML theory into high-impact oncology projects.

For research students, designing a competitive project proposal requires cutting through the popular media hype of quantum computing. The most compelling argument for QML in 2026 is not computational speed, it is sample efficiency.

Stage-1: The practical paradigm and algorithmic taxonomy

The Present vs. The Future of QML

- **The Present (NISQ Era):** We operate on Noisy Intermediate-Scale Quantum hardware (36–500 qubits). These chips lack error correction and cannot handle large-scale classical datasets due to data-loading (QRAM) bottlenecks. Therefore, current winning strategies leverage hybrid quantum-classical pipelines. A classical GPU cluster handles the data preprocessing, while a Quantum Processing Unit (QPU) processes highly compressed, abstract mathematical mappings.
- **The Future (Fault-Tolerant Era):** The upcoming shift toward fault-tolerant quantum computing (FTQC) with thousands of logical qubits will allow algorithms to process raw, native biological data directly on-chip. The long-term future will move from

simple classification to simulating dynamic multi-cellular tumor environments and evolutionary drug resistance over time.

The QML Toolset: Three Core Architectures for Project Planning

When writing the “Research Strategy” section of a Project, Student should select and justify their quantum architecture based on these three distinct model families:

1. Quantum Kernels & Quantum Support Vector Machines (QSVM): These algorithms project classical biological inputs into a massive, multi-dimensional quantum state space (Hilbert Space). They exploit superposition and entanglement to reveal hidden, non-linear relationships that classical algorithms completely miss.
2. Variational Quantum Circuits (VQCs) / Quantum Neural Networks (QNNs): These are parameterized circuits optimized using classical gradient descent. They function as the quantum equivalent of deep neural layers but feature a far higher “expressive capacity,” meaning they require significantly fewer parameters to characterize complex biological phenotypes.
3. Quantum Approximate Optimization Algorithms (QAOA): Ideal for discrete optimization, these networks excel at feature selection, isolating the top 10 most predictive spatial or genomic variations out of a pool of millions.

Unlocking Heterogeneity: Breast Cancer Single-Cell & Spatial Data

Breast cancer is a highly complex disease defined by spatial and cellular diversity. While single-cell RNA sequencing (scRNA-seq) profiles individual cell types, it destroys the physical architecture of the tumor. Conversely, spatial transcriptomics (ST) preserves the physical coordinate map but faces high noise, sparse data matrices, and limited patient sample sizes. This structural complexity makes breast cancer an ideal domain for QML.

[Spatial Transcriptomics] + [scRNA-seq Multi-Omics]



[High-Dimensional Data Matrix]



[Quantum Kernel Feature Mapping (Hilbert Space)]



[Discovery of Granular, Non-Trivial Cellular Subtypes]

Evidence from the Field:

A breakthrough study, “Quantum enhanced stratification of Breast Cancer: exploring quantum expressivity for real omics data,” addressed this exact bottleneck [1]. Researchers applied Quantum Kernels (QK) to complex, multi-omic breast cancer datasets to detect highly granular tumor structures and identify new patient sub-populations.

Key Finding for Project Proposals: The study demonstrated that Quantum Kernels yielded comparable and often superior clustering results to state-of-the-art classical methods while requiring significantly fewer data points. Furthermore, they ran the algorithm on a physical QPU and proved that the computational pipeline is inherently resilient to hardware noise [2]. This provides immediate, peer-reviewed justification for project proposals looking to use current NISQ hardware for precision oncology.

Stage-2: Clinical translation & high-index breakthroughs

Deep Dive: Bypassing the Small-Cohort Bottleneck. Traditional AI and deep learning models are notoriously data-hungry. To apply a conventional deep network to the 3-billion-nucleotide human genome, the model would theoretically require roughly 33 trillion patients to train without overfitting. Yet, the stark clinical reality is that most high-impact oncology clinical trials or rare-cancer cohorts enroll only 20 to 100 people [5]. This is where the true, modern “quantum advantage” emerges. QML architectures excel at finding relevant, low-noise signals within small, sparse, high-dimensional datasets.

In a highly publicized study published in APL Quantum, an interdisciplinary team including Orly Alter (University of Utah), Elizabeth Newman (Tufts University), Sri Priya Ponnappalli (Scale AI), and Jessica W. Tsai (Children's Hospital of Los Angeles / USC Keck School of Medicine) demonstrated a major clinical milestone for quantum mathematics [2].

The Innovation: Multitensor Comparative Spectral Decompositions

Instead of relying on standard neural networks, the team engineered a quantum mechanics-based multitensor AI/ML framework built directly on the principles of superposition and entanglement [1, 3].

- The Prism Metaphor: Think of the algorithm like a prism splitting white light into individual color components. The technique takes multiple unaligned, noisy layers of biological data, including tumor DNA, blood DNA, and tumor RNA transcriptomes—and breaks them down into mathematically linked, entangled outcome patterns [3].
- The Dataset: They tested this framework on open-source multi-omics data from 101 patients with neuroblastoma (a devastating pediatric cancer), processing approximately 6 million molecular features [4].

The Clinical & Experimental Validation

The quantum-based method successfully discovered two entirely new predictors of patient life expectancy in response to targeted therapies [1, 4].

- The Performance: These two-novel quantum-derived biomarkers consistently outperformed standard clinical biomarkers (such as the traditional single-gene MYCN amplification test) across all data layers [1, 5].
- Interpretability: Unlike classical deep learning networks, which operate as uninterpretable “black boxes,” these quantum predictors are fully transparent. They point directly to the underlying disease mechanisms and highlight the exact gene targets needed to sensitize tumors to treatment [4].
- The Biotechnology Holy Grail: These targets and survival outcomes have been successfully validated both computationally in separate patient cohorts and experimentally using CRISPR-Cas9 genome editing [1,4]. Alter’s university spinoff, Prism AI Therapeutics, Inc., is already commercializing these predictors to optimize patient selection for pharmaceutical clinical trials [3].

For students: When framing your next project proposal, adapt these proven 2026 concepts into your Specific Aims section:

- Aim 1 (Framework Design): “To develop a hybrid quantum-classical pipeline using Parameterized Quantum Circuits (PQCs) to map cellular-level spatial transcriptomic dependencies in breast cancer tumors, optimizing sample complexity over classical convolutional neural networks.”
- Aim 2 (Addressing Scarcity): “To leverage quantum multitensor comparative spectral decompositions to integrate mismatched, high-noise clinical trial data ($n < 50$) across

tissue RNA and blood DNA, bypassing the data-volume bottlenecks of conventional deep learning.”

- Aim 3 (Validation Strategy): “To computationally validate quantum kernel-derived cellular subtypes against independent cohorts, evaluating trainability against noise-induced barren plateaus using local cost functions.”

Future Quantum Research Projects:

Fault-Tolerant, Large-Scale, and Native Quantum Data

- What it is: A future marked by Fault-Tolerant Quantum Computing (FTQC), featuring thousands of stable, error-corrected logical qubits.
- How it will work: Algorithms will process native biological datasets directly on quantum architectures without losing state coherence.
- The Transformation: QML will move from simple classification tasks (e.g., benign vs. malignant) to simulating entire cellular microenvironments, predicting gene-to-gene spatial dependencies, and testing drug reactions on virtual patient models before a clinical trial even begins.

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