

Ting-Yuan Wang

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EDUCATION

Bachelor of Science in Computer Science and Information Engineering

National Central University (NCU)

Sep 2021 – Jun 2024

Taoyuan City, Taiwan

- Last60 GPA: 3.98/4.0 Major GPA: 3.89/4.0
- Presidential Award (Top 3% students in the dept.) in 2023 fall

PUBLICATIONS

- [1] Li-Jie Jian, **Ting-Yuan Wang**, Bo-Yin Yang and Ming-Shing Chen. (2024) "*Jumping for Bernstein-Yang Inversion*" The 29th Australasian Conference on Information Security and Privacy.
- [2] J. -R. Jiang, **T. -Y. Wang**, W. -H. Huang and J. -Z. Zhang. (2023) "*Distributed Shor's Algorithm with Sequential Quantum Teleportation*" 2023 IEEE 5th Eurasia Conference on IOT, Communication and Engineering (ECICE).

RESEARCH EXPERIENCE & PROJECTS

Institute of Information Science, Academia Sinica

Research assistant of Prof. Bo-Yin Yang in Post quantum cryptography

Taipei, Taiwan

Mar 2022 – present

Jumping for Berstein-Yang Inversion

- Noticeably accelerate streamline NTRU-Prime key generation, **33x faster** than OpenSSH.
- Combine the theoretically best constant-time polynomial inversion algorithm by far (Jumpdivsteps) with Number Theoretic Transform (NTT) based algorithms and improve the combined structure, reducing the required number of NTTs on matrices.
- Optimize polynomial multiplications with NTT across a range of polynomial lengths on ARMv8 with NEON.
- Publish the results at ACISP 2024.

Verification of cryptosystem using Cryptoline

- Verify several NTT polynomial multiplications, constant time extend-GCD and NTRU-Prime.
- Improve Cryptoline, a tool and language for the verification of low-level implementations of mathematical constructs.

Advanced Computing And Networking Lab, National Central University

Advisor: Prof. Jehn-Ruey Jiang in Quantum computing

Taoyuan, Taiwan

Sep 2022 – Jan 2024

Distributed Shor's Algorithm with Sequential Quantum Teleportation

- Propose a new distributed Shor's algorithm with sequential quantum teleportation.
- Publish the results at IEEE ECICE 2024.
- Reduce minimum quantum computer scale requirement from $3L + 1$ to $2.5L + 2$ qubits.
- Reduce the required quantum circuit depth for Shor's algorithm.
- Perform experiments and verification on IBM Quantum Lab.

Hackathon: Qubit Tapering

- Win 3rd place of Qiskit Hackathon Taiwan 2023.
- Exploit the inherent symmetry structure of molecules to reduce qubits needed when simulating.
- Simplifies the complexity of calculations and reducing error rates on finding the ground state of molecules.
- The improvement grows exponentially with the number of qubits tapered.
- Construct experiments with Qiskit on H_2 , HeH^+ , H_2O and NH_3 .

Hackathon: Hamiltonian Cycle

- The Finalist of the Quantum Science and Technology Hackathon 2022.
- Construct quantum circuit to solve 5-node Hamiltonian Cycle problem based on on explicit Graphs with Grover's Algorithm.

Hybrid autoencoder on anomaly detection

- Used PennyLane to implement a 3-layer classical autoencoder, along with angle embedding circuit and 3-layer quantum autoencoder for feature extraction.
- Utilized the Isolation Forest algorithm for anomaly detection experiments.
- Tested the model on two datasets, the hybrid autoencoder achieved a 33% higher F1 score on one dataset compared to the classical autoencoder, the other was 1% lower.

Quantum financial research, National Central University

Advisor: Prof. Szu-Cheng Cheng in Quantum computing

Taoyuan, Taiwan

Sep 2022 – present

Quantum pairs trading experiments

- Utilize Quantum Phase Estimation (QPE) to discover the eigenvalues of a matrix formed by historical data of multiple stocks.
- Calculate the portfolio's multi-collinearity and set a threshold to monitor portfolios with high multi-collinearity for pairs trading opportunities.
- Backtest the strategy using one-year historical data from the top 500 U.S. stocks, achieving a xx% return without accounting for transaction costs.

AWARDS

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OTHER EXPERIENCES

Co-founder, FalCo Multimedia Company, Taoyuan, Taiwan

Mentor: Prof. Po-Chyi Su

Dec 2020 – Jul 2021

- Won the Silver Award in National Central University innovation conference.
- Optimize the 3D-scanning performance of human hairstyles on Intel D435.
- Cooperate with *Smartist Technology Company* to design a communication App for customer service at exhibitions during COVID-19.

Teaching Assistant — National Central University

Sep 2023 – Jun 2024

College of Science, National Central University

- Spring 2024: Quantum Computation.
- Spring 2024: Quantum Experiments and Exercises.
- Fall 2023: Introduction to Quantum Computer Science.

SKILLS

Programming Tools: C, Python, ARM assembly, NEON intrinsics, Qiskit, PennyLane, C++