

Mu-Te Lau

Graduate Researcher Specialized in Quantum Circuit Compilation

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Education

Northwestern University

Ph.D. in Computer Science (Advisor: Nikos Hardavellas)

Evanston, IL, USA

Sep. 2025–Jun. 2030 (Expected)

National Taiwan University

M.S. in Electrical Engineering (Advisor: Chung-Yang (Ric) Huang, GPA: 3.94/4.30)

Taipei, Taiwan

Sep. 2022–Jun. 2024

- Received 2022 GIEE Scholarship for Outstanding Academic Performance (Top 8% GPA in 236 students)
- Completed the Quantum Computation and Quantum Information Program organized by Dept. of Physics, NTU

National Taiwan University

B.S. in Electrical Engineering (GPA: 3.86/4.30; GPA since junior: 3.95/4.30)

Taipei, Taiwan

Sep. 2017–Jun. 2022

Research Experience

Northwestern University

Graduate Research Assistant (Advisor: Nikos Hardavellas)

Evanston, IL, USA

Sep. 2025–Present

- Developing hardware-aware compilation techniques for quantum Hamiltonian simulation
- Studying stabilizer theories for CV-DV quantum computer compilations
- Architecting an MLIR-based quantum compiler framework to support hybrid quantum architectures

Design Verification Lab, National Taiwan University

Research Assistant; later promoted to Research Associate (Advisor: Chung-Yang (Ric) Huang)

Taipei, Taiwan

Sep. 2022–Feb. 2025

- Initiated and led Qsyn as primary developer, growing it into an open-source quantum circuit synthesis framework with 190+ GitHub stars
- Designed Qsyn as a platform for users to compose and explore alternative quantum compilation strategies
- Reimplemented and advanced tableau-based quantum circuit optimization methods to reduce 2Q-count overhead

Publications

SEQC: Stratify-Elaborate Quantum Compilation Towards Modular Hybrid Architectures

Northwestern University, IL, USA



Mingyoung Jessica Jeng, Nikola Vuk Maruszewski, **Mu-Te Lau**, Connor Selna, Michael Gavrincea, Kaitlin N. Smith, Nikos Hardavellas

Sep. 2026, IEEE QCE'26

- Achieved 9.3–32.3% average circuit-fidelity improvement and $1.34\text{--}3.27\times$ faster compilation over a chiplet-unaware Qiskit baseline
- Parallelization-friendly compilation for modular architectures with novel placement, routing, and optimization methods

A Lazy Resynthesis Approach for Simultaneous T Gate and Two-Qubit Gate Optimization of Quantum Circuits

National Taiwan University, Taiwan

Mu-Te Lau, Hsiang-Chun Yang, Hsin-Yu Chen, Chung-Yang (Ric) Huang

Sep. 2025, IEEE QCE'25

- Presented at IEEE Quantum Week (QCE) 2025
- Reduced 2Q-count overhead by 54.8% for tableau-based quantum circuit optimization while achieving $1.81\times$ speedup

Multi-Objective Quantum Circuit Optimization by Combining Tableau-Based and ZX-Diagram-Based Techniques

National Taiwan University, Taiwan

Mu-Te Lau (Advisor: Chung-Yang (Ric) Huang)

Jul. 2024, Master's Thesis

- Proposed a hybrid QCO flow for Clifford+T circuits that give a 29.4% improvement in 2Q-counts over purely tableau-based flows

Qsyn: A Developer-Friendly Quantum Circuit Synthesis Framework for NISQ Era and Beyond

National Taiwan University, Taiwan

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Mu-Te Lau, Chin-Yi Cheng, Cheng-Hua Lu, Chung-Yang (Ric) Huang (Corresponding Author), et al.

Apr. 2024, arXiv Preprint

- A fast and modular framework for quantum circuit synthesis, offering a flexible and extendable CLI for pass composition
- Poster presented at IEEE QCE'24 and 6th IWQC

Teaching Experiences

Special Topics on Quantum Design Automation

National Taiwan University, Taiwan

Head of Teaching Assistant, Graduate Institute of Electrical Engineering

2023 Fall

- Instructors: Profs. Chung-Yang (Ric) Huang, Jie-Hong (Roland) Jiang, James Chien-Mo Li, Shih-Hao Hung
- **Gave a TA lecture on ZX-calculus-based Quantum Circuit Optimization**
- Designed and graded assignments and final exams

Quantum Information and Computation

National Taiwan University, Taiwan

Head of Teaching Assistant, Graduate Institute of Electrical Engineering

2023 and 2024 Spring

- Instructor: Prof. Hao-Chung Cheng
- Designed and graded assignments and exams

Web Programming

National Taiwan University, Taiwan

Teaching Assistant, Department of Electrical Engineering

2022 and 2023 Fall

- Instructor: Prof. Chung-Yang (Ric) Huang
- Graded term projects, designed programming assignments, and maintained the course website

Project Experiences

Qsyn | arXiv  |  190+ ★

National Taiwan University, Taiwan

Quantum Computing; Modern C++; Docker

2022 Fall–Now

- **Reimplemented and improved QCO algorithms to assess for scalable, high-performance quantum circuit synthesis**
- Implemented a flexible command-line interface to combine QCO algorithms flexibly
- Coordinated refactorings to core data structures to ensure code quality and flexibility
- Guided new team members on their contributions and taught them good coding practices

ZX-Diagrams as Intermediate Representation for Lattice Surgery Compilation

National Taiwan University, Taiwan

Survey, C++

2022 Spring–2023 Summer

- Term projects of the courses *Fault-Tolerant Computing* and *Quantum Information and Computation*
- **Selected to be Exemplar Presentation Videos in the 2022 Quantum Information and Computation Course**
- Compiled Fault-Tolerant Quantum Circuit to Lattice Surgery with ZX-calculus-based methods
- Achieved compact compilation results for quantum circuits with a small number of qubits

Leadership Experiences

Band Leader; Chair Euphonium Player; Social Media Editor

Taipei, Taiwan

National Taiwan University Wind Band

Aug. 2019–Aug. 2024

- Coordinated, as the band leader, the band's rehearsals and performances and solved administrative difficulties during the COVID pandemic
- Promoted, as the social media editor, the band's events by garnering over 169.7K in reach and growing Instagram followers by 43%

Server & Network Administrator

Taipei, Taiwan

Design Verification Lab, National Taiwan University

Feb. 2022–Feb. 2025

- Maintained the lab servers and pertinent hardware such as routers, NAS, and firewalls
- Built comprehensive documentation for future administrators

Skills

Programming	Modern C++, Shell, Python, JavaScript, Rust
Quantum Computing Tools	Qiskit, PyZX, Feynman
Web Development	JS/React, Next.js, Docker, MongoDB
Languages	Mandarin (Native), English (Proficient), Japanese (Basic), German (Basic)