

Mu-Te Lau

Graduate Researcher Specialized in Quantum Circuit Compilation

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Education

Northwestern University

PhD in Computer Science

- Specialization: Quantum Compiler and Quantum System Software

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))

- Studied logical quantum circuit synthesis and optimization
- **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

Taipei, Taiwan

Sep. 2022–Jun. 2024

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

Design Verification Lab, National Taiwan University

Part-Time Research Assistant; later promoted to Research Associate

- Researched quantum circuit optimization for the *Quantum Program Verification and Transformation* Project, funded by NSTC, Taiwan
- Helped prepare course material for the *Open-Source Software Talent Development in Quantum Computing* Project, funded by MOE, Taiwan
- Led the development and maintenance of Qsyn, an open-source quantum circuit synthesis framework developed by our lab

Taipei, Taiwan

Sep. 2022 - Feb. 2025

Publications

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

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

Sep. 2025, To appear on IEEE QCE 2025

- **Reduced 2Q-count overhead by 54.8% for tableau-based quantum circuit optimization while achieving $1.81\times$ speedup**
- A more scalable approach to ZX-calculus-based optimizations while yielding comparable 2Q-counts

Multi-Objective Quantum Circuit Optimization by Combining Tableau-Based and ZX-Diagram-Based Techniques | Master's Thesis

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**
- Revealed a trade-off between the choice of data structures that influence the optimization of two-qubit gate counts and T/H- gate counts

Qsyn: A Developer-Friendly Quantum Circuit Synthesis Framework for NISQ Era and Beyond | arXiv | 160+ ★

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

Apr. 2024, Preprint

- **Poster presented on IEEE QCE 2024 in Montréal, Canada and 6th IWQC in Berlin, Germany**
- A fast, modular, and research-backed open-source framework for quantum circuit synthesis

National Taiwan University, Taiwan

National Taiwan University, Taiwan

Teaching Experiences

Special Topics on Quantum Design Automation

Head of Teaching Assistant, Graduate Institute of Electrical Engineering

- 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

National Taiwan University, Taiwan

2023 Fall

Quantum Information and Computation

Head of Teaching Assistant, Graduate Institute of Electrical Engineering

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

National Taiwan University, Taiwan

2023 and 2024 Spring

Web Programming

Teaching Assistant, Department of Electrical Engineering

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

National Taiwan University, Taiwan

2022 and 2023 Fall

Project Experiences

Qsyn | arXiv  160+ ★

Quantum Computing; Modern C++; Docker

- **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 with their contributions and taught them good coding practices

National Taiwan University, Taiwan

2022 Fall–Now

Design Verification Lab Website | 

JS/React; MongoDB; Docker

- Developed a new website with other labmates
- Enhanced web development skills, esp. in implementing data flow

National Taiwan University, Taiwan

2021 Spring

ZX-Diagrams as Intermediate Representation for Lattice Surgery Compilation

Survey, C++

- 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

National Taiwan University, Taiwan

2022 Spring–2023 Summer

Volunteer Experiences

Community Concert

National Taiwan University Wind Band

- Held free concerts annually on the Chinese Moon Festival at Ching-Pai Village, Taipei

Taipei, Taiwan

2017 Fall–2023 Fall

College Programming Peer Tutor

Department of Electrical Engineering, National Taiwan University

- Provided coding assistance for other students in the campus

Taipei, Taiwan

Mar. 2021–May 2021

Leadership Experiences

Band Leader; Chair Euphonium Player; Social Media Editor

National Taiwan University Wind Band

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

Taipei, Taiwan

Aug. 2019–Aug. 2024

Server & Network Administrator

Design Verification Lab, National Taiwan University

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

Taipei, Taiwan

Feb. 2022–Feb. 2025

Certificates

- 2023 **TOEFL iBT**, 108/120
Reading 30 / Listening 29 / Speaking 22 / Writing 27
- 2021 **GRE General Test**, 335/340
Quantitative 170 / Verbal 165 / Analytic Writing 4.0

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)