Zhiding Liang

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222 Cushing Hall of Engineering, Notre Dame, IN, 46556

Education

Doctor of Philosophy | ***Computer Science and Engineering*** — Jul. 2021 – Present
University of Notre Dame, Advisor: Prof. Yiyu Shi — South Bend, IN, USA

Visiting PhD Student | ***Computer Science*** — Feb. 2023 – June. 2023
Yale University, Advisor: Prof. Yongshan Ding — New Haven, CT, USA

Bachelor of Science | ***Electrical and Computer Engineering*** — Aug. 2018 – Dec. 2020
University of Wisconsin - Madison, Advisor: Prof. Jude Shohet — Madison, WI, USA

Bachelor of Science | ***Computer Engineering*** — Aug. 2016 – May. 2018
Auburn University, Transferred — Auburn, AL, USA

Research Interest

- Varational Quantum Algorithms
- Quantum Pulse Control
- Quantum Machine Learning and Machine Learning for Quantum
- Hardware/Software Co-design for Quantum Computing

Honors and Awards

Edison Innovation Fellowship — 2023
IDEA Center at the University of Notre Dame

Student Travel Award — 2023
International Symposium on Computer Architecture (ISCA)

DAC Young Fellow with Travel Grant — 2022
IEEE/ACM Design Automation Conference (DAC)

DAC Young Fellow — 2021
IEEE/ACM Design Automation Conference (DAC)

Certificate of Quantum Excellence — 2021
IBM

Dean's List — 2018 Fall - 2020 Spring
University of Wisconsin - Madison

Dean's Honor List — 2017 Spring - 2018 Spring
Auburn University

PUBLICATIONS

Conference

[1] QuCS: A Lecture Series on Quantum Computer Software and System
Zhiding Liang, Hanrui Wang
Quantum Science and Engineering Education Conference and IEEE International Conference on Quantum Computing and Engineering (QCE), 2023

[2] Hybrid Gate-Pulse Model for Variational Quantum Algorithms
Zhiding Liang, Zhixin Song, Jinglei Cheng, Zichang He, Ji Liu, Hanrui Wang, Ruiyang Qin, Yiru Wang, Song Han, Xuehai Qian, Yiyu Shi
IEEE/ACM Design Automation Conference (DAC), 2023

[3] Variational Quantum Pulse Learning
Zhiding Liang*, Hanrui Wang*, Jinglei Cheng, Yongshan Ding, Hang Ren, Zhengqi Gao, Duane Boning, Xuehai Qian, Song Han, Weiwen Jiang, Yiyu Shi
IEEE International Conference on Quantum Computing and Engineering (QCE), 2022

[4] TorchQuantum Case Study for Robust Quantum Circuits
Hanrui Wang, **Zhiding Liang**, Jiaqi Gu, Zirui Li, Yongshan Ding, Weiwen Jiang, Yiyu Shi, Xuehai Qian, David Z. Pan, Frederic T. Chong, Song Han
IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2022

[5] Can Noise on Qubits Be Learned in Quantum Neural Network? A Case Study on QuantumFlow
Zhiding Liang, Zhepeng Wang, Junhuan Yang, Lei Yang, Yiyu Shi, Weiwen Jiang
IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2021

[6] Exploration of Quantum Neural Architecture by Mixing Quantum Neuron Designs
Zhepeng Wang, **Zhiding Liang**, Shanglin Zhou, Caiwen Ding, Yiyu Shi, Weiwen Jiang
IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2021

[7] A comprehensive understanding of conductive mechanism of RRAM: from electron conduction to ionic dynamics
Zhiding Liang
International Conference on Electrical Engineering and Control Technologies (CEECT), 2020

In Submission

[1] NAPA: Intermediate-level Variational Native-pulse Ansatz for Variational Quantum Algorithms [Under Review]
Zhiding Liang, Jinglei Cheng, Hang Ren, Hanrui Wang, Fei Hua, Yongshan Ding, Fred Chong, Song Han, Xuehai Qian, Yiyu Shi
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD) (2023)

[2] Universal Approximability of Deep Learning in Hybrid Quantum-Classical Computing
Weiwen Jiang, **Zhiding Liang**, Yukun Ding, Zhepeng Wang, Lei Yang, Yiyu Shi [Under Review]
Journal of Machine Learning Research (2022)

Pre-Print

[1] Unleashing the Potential of LLMs for Quantum Computing: A Study in Quantum Architecture Design
Zhiding Liang, Jinglei Cheng, Rui Yang, Hang Ren, Zhixin Song, Di Wu, Xuehai Qian, Tongyang Li, Yiyu Shi
arXiv Pre-print (2023)

[2] Towards Advantages of Parameterized Quantum Pulses
Zhiding Liang, Zhixin Song Jinglei Cheng, Hang Ren, Rui Yang, Hanrui Wang, Kecheng Liu, Peter Kogge, Tongyang Li, Yongshan Ding, Yiyu Shi
arXiv Pre-print (2023)

[3] Improving Quantum Classifier Performance in NISQ Computers by Voting Strategy from Ensemble Learning
Ruiyang Qin, **Zhiding Liang**, Jinglei Cheng, Peter Kogge, Yiyu Shi
arXiv Pre-print (2022)

[4] TopGen: Topology-Aware Bottom-Up Generator for Variational Quantum Circuits
Jinglei Cheng, Hanrui Wang, **Zhiding Liang**, Yiyu Shi, Song Han, Xuehai Qian
arXiv Pre-print (2022)

ORGANIZE EXPERIENCE

Quantum Computer Systems (QuCS) Lecture Series July 2022 - now
https://sites.nd.edu/quantum/

- Lead to organize QuCS, which is a Quantum computer systems lecture series from introduction session to research topic session. Currently have 2500+ subscribers and over 50 confirmed speakers from over 30 institutions including both industry and academia of 8 different countries.
- Provide a great platform for people who are interested in quantum computing to learn the concepts of quantum computing and continue the discussion of cutting-edge research topics.

FinQ Tech Feb 2023 - now
https://finq.tech/

- Take the role of the seminar pillar at FinQ Tech. FinQ Tech is one of the largest quantum technology focused communities in the US with a global footprint. Our members are from various quantum technology companies, top universities, and research institutions. 50% of them are PhDs and postdocs in quantum-related fields.
- As a 501(c)(3) non-profit organization, we aim to provide a top learning environment and academia-industry connection for our members. Also, lead the efforts of creating quantum education material and developing practical quantum-enabled applications.

2023 Quantum Computing for Drug Discovery Challenge at ICCAD Aug. 2023 - Oct. 2023
42nd IEEE/ACM International Conference on Computer-Aided Design (ICCAD) San Francisco, CA, USA

- Lead to organize the ACM/IEEE Quantum Computing for Drug Discovery Challenge at ICCAD. It is a challenging, multi-month, research and development competition, focusing on drug discovery-related problems that require the implementation of quantum algorithms. It is open to multi-person teams world-wide.

Parameterized Quantum Pulses and It's Application Sep. 2023
IEEE International Conference on Quantum Computing and Engineering Seattle, WA, USA

- Lead to organize the quantum computing tutorial session about the parameterized quantum pulses at QCE 2023 and gave a tutorial talk as an instructor.

TorchQuantum: A Fast Library for Parameterized Quantum Circuits June. 2023
50th International Symposium on Computer Architecture (ISCA) Orlando, FL, USA

- Co-organized the quantum computing tutorial session about the TorchQuantum library at ISCA 2023 and gave a tutorial talk as an instructor.

Tutorial: TorchQuantum Case Study For Robust Quantum Circuits Nov. 2022
41st IEEE/ACM International Conference on Computer-Aided Design (ICCAD) San Diego, CA, USA

- Co-organized the quantum computing tutorial session about the TorchQuantum library at ICCAD 2023 and gave a tutorial talk as an instructor.

TorchQuantum: A Fast Library for Parameterized Quantum Circuits Sep. 2022
IEEE International Conference on Quantum Computing and Engineering Broomfield, CO, USA

- Co-organized the quantum computing tutorial session about the TorchQuantum library at QCE 2023 and gave a tutorial talk as an instructor.

INVITED TALKS

Parameterized Quantum Pulses for Variational Quantum Algorithms Sep. 2023
MAIB by Society of Artificial Intelligence Research (SAIR) Remote

Hybrid Gate - Pulse Model for Variational Quantum Algorithm April. 2023
QUARK Lab at Peking University Remote

Scalable Design-Program-Compilation Optimizations for Quantum Algorithms July.2022
59th ACM/IEEE Design Automation Conference (DAC) San Francisco, CA

A Quantum Machine Learning Co-Design Framework Towards Quantum Advantage Nov. 2021
40th IEEE/ACM International Conference on Computer-Aided Design (ICCAD) Remote

Turtorial on Quantumflow Nov. 2021
Embedded Systems Week (ESWEEK), 2021 Remote

EMPLOYMENT

Research Assistant Jul. 2021 – Now
Department of Computer Science and Engineering, University of Notre Dame South Bend, IN, USA

Quantum Computing Research Technology Associate Intern June 2023 – Aug. 2023
JPMorgan Chase & Co New York, NY, USA

Research Assistant Feb 2023 – June. 2023
Department of Computer Science at Yale University New Haven, CT, USA

Research Assistant Sep. 2019 – Jan. 2020
Plasma Processing & Technology lab at UW-Madison Madison, WI, USA

Backend Developer Intern July. 2018 – Aug. 2018
Silan Microelectronics Co., Ltd Hangzhou, China

Teaching and Mentoring

Teaching Assistant

CSE 34341 Operating Systems Principles, University of Notre Dame — Spring 2022

CSE 20289 Systems Programming, University of Notre Dame — Fall 2021

Guest Lecturer

ECE6210 Machine Intelligence, George Washington University — Nov. 2023

Professional Service

Committee Member

Quantum Science and Engineering Education Conference (QSEEC) — 2023

Quantum System Stability and Reproducibility Workshop — 2023

Conference Reviewer

International Conference on Learning Representations (ICLR) — 2024

Neural Information Processing Systems (NeurIPS) — 2023

ACM/IEEE International Workshop on Quantum Computing — 2022

Design Automation Conference (DAC) — 2021

Journal Reviewer

Quantum Information Processing

Session Chair

IEEE International Conference on Quantum Computing and Engineering (QCE) — 2023

REFERENCE

Professor Yiyu Shi — PhD advisor, Professor
yshi4@nd.edu — University of Notre Dame

Professor Peter Kogge — Ted H. McCourtney Professor
Peter.M.Kogge.1@nd.edu — University of Notre Dame

Professor Fred Chong — Seymour Goodman Professor
chong@cs.uchicago.edu — University of Chicago

Professor Robert Wille — Distinguished Professor
robert.wille@tum.de — Technical University of Munich, Germany

Professor Yufei Ding — Associate Professor
yufeiding@ucsd.edu — University of California San Diego

Dr Marco Pistoia — Managing Director, Distinguished Engineer
marco.pistoia@jpmchase.com — JPMorgan Chase & Co