

ZHAN YU

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Ph.D. student at Centre for Quantum Technologies

National University of Singapore ♦ Block S15, 3 Science Drive 2, Singapore, 117543

RESEARCH INTERESTS

My research interests lie in quantum computing and quantum information, with a particular focus on quantum algorithms and quantum machine learning. My research aims to develop quantum algorithms that provide improvements over their classical counterparts. I am also interested in theoretical computer science in general.

EDUCATION

National University of Singapore, Singapore Sep. 2023 - Present.
Ph.D. in Quantum Computing
Supervisor: Dr. Patrick Rebentrost

University of Calgary, Calgary, AB Sep. 2019 - Sep. 2021
M.Sc. in Computer Science
Thesis: Quantum walks on arc-transitive graphs with self-loops
Supervisor: Dr. Peter Høyer
Overall GPA: 3.93/4

University of Calgary, Calgary, AB Sep. 2016 - Jun. 2019
B.Sc. Honours in Computer Science (Minor in Pure Math)
Thesis: Efficient quantum walk on the grid using self-loops
Supervisor: Dr. Peter Høyer
Overall GPA: 3.97/4

Wuhan University of Technology, Wuhan, Hubei Sep. 2014 - Jun. 2016
B.Eng. in Software Engineering
Overall GPA: 88.12/100

RESEARCH EXPERIENCE

School of Mathematics and Statistics, *Wuhan University* May 2023 - Aug. 2023
Visitor
Host: Dr. Yinan Li
Conduct research projects in quantum algorithms and quantum machine learning, focusing on the expressive power and generalization of quantum machine learning models.

Institute for Quantum Computing, *Baidu Research* Nov. 2021 - May 2023
Research & Development Intern
Mentor: Dr. Xin Wang

- Conducted various research projects in quantum algorithms, quantum information, and quantum machine learning, which lead to top-tier publications and over 20 patents. Discovered the expressivity of quantum neural networks and further extended the model to the multi-qubit quantum phase processing framework, which leads to intuitive and efficient quantum algorithms for solving problems that are particularly phase-related.
- Involved in developing the Paddle Quantum and Quantum Leaf platform, which allow users to design, test, and deploy quantum programs on quantum simulators and real quantum computers through cloud services. Developed the variable ansatz module, quantum singular value transformation module, quantum phase processing module and the corresponding tutorials.

Institute for Quantum Science and Technology, University of Calgary
Research Assistant
Supervisor: Dr. Peter Høyer

Apr. 2018 - Sep. 2021

- Conducted research projects in quantum walk search algorithms. Analyze the time complexity and success probability of the lackadaisical quantum walk from theoretical aspects, which proves several numerical findings and an open conjecture in previous work.
- Involved in developing a MATLAB toolbox for efficiently simulating quantum walks on various types of graphs and calculating the quantum hitting time and the success probability.

Department of Computer Science, University of Calgary

Sep. 2019 - May. 2021

Teaching Assistant

DATA 211 - Programming with Data

CPSC 217 - Introduction to Computer Science for Multidisciplinary Studies I

CPSC 231 - Introduction to Computer Science for Computer Science Majors I

CPSC 519/619 - Introduction to Quantum Computation

PUBLICATIONS

(*) indicates the alphabetical order or co-first author.

1. **Zhan Yu**, Qiu hao Chen, Yuling Jiao, Yin an Li, Xiliang Lu, Xin Wang, and Jerry Zhijian Yang, "Provable Advantage of Parameterized Quantum Circuit in Function Approximation", Oct. 11, 2023, arXiv: 2310.07528 [quant-ph], preprint
2. Yifei Chen, **Zhan Yu**, Chenghong Zhu, and Xin Wang, "Efficient Information Recovery from Pauli Noise via Classical Shadow", May 6, 2023, arXiv: 2305.04148 [math-ph, physics:quant-ph], preprint
3. **Zhan Yu**, Xuanqiang Zhao, Benchu Zhao, and Xin Wang, "Optimal Quantum Dataset for Learning a Unitary Transformation", *Physical Review Applied* 19.3, Mar. 6, 2023, p. 034017
4. Youle Wang, Lei Zhang, **Zhan Yu**, and Xin Wang, "Quantum Phase Processing and Its Applications in Estimating Phase and Entropies", Sept. 28, 2022, arXiv: 2209.14278 [math-ph, physics:quant-ph], preprint
5. **Zhan Yu**, Hongshun Yao, Mujin Li, and Xin Wang, "Power and Limitations of Single-Qubit Native Quantum Neural Networks", in: *Advances in Neural Information Processing Systems*, ed. by S. Koyejo, S. Mohamed, A. Agarwal, D. Belgrave, K. Cho, and A. Oh, vol. 35, Curran Associates, Inc., 2022, pp. 27810–27823
6. Peter Høyer and **Zhan Yu***, "Analysis of Lackadaisical Quantum Walks", *Quantum Information and Computation* 20, 13&14 Nov. 2020, pp. 1138–1153

TALKS

1. *Power and limitations of single-qubit native quantum neural networks.* 2022
Presented at 36th Conference on Neural Information Processing Systems (NeurIPS 2022, Online).
2. *Analysis of lackadaisical quantum walks.* 2021
Poster presented at 24th Conference on Quantum Information Processing (QIP 2021, Online).

AWARDS & SCHOLARSHIPS

Outstanding Intern Award 2022, Baidu Research

Dec. 2022

Alberta Innovates Graduate Student Scholarships 2020, University of Calgary

Nov. 2020

Alberta Graduate Excellence Scholarship (AGES) 2020, University of Calgary

Jul. 2020

Alberta Graduate Excellence Scholarship (AGES) 2019 , <i>University of Calgary</i>	Nov. 2019
International Graduate Recruitment Award 2019 , <i>University of Calgary</i>	Sep. 2019
Visa Differential Scholarship , <i>University of Calgary</i>	Sep. 2019
International Undergraduate Award 2018 , <i>University of Calgary</i>	Dec. 2018
SUPER Work Award 2018 , <i>University of Calgary</i>	Sep. 2018
George Loo Scholarship in Computer Science , <i>University of Calgary</i>	Jul. 2018
Program for Undergraduate Research Experience (PURE) Award , <i>University of Calgary</i>	May 2018
Transfer Student Scholarship , <i>University of Calgary</i>	Sep. 2016
Third Tier Scholarship , <i>Wuhan University of Technology</i>	Oct. 2015

SERVICES

Reviewer for Journals: Quantum

Reviewer for Conferences: TQC, AQIS