

# WENJUN YU

Tel.: +852-65965471 ◊ Email: wenjunyus@gmail.com

## EDUCATION

---

### Tsinghua University

*B. E. in Computer Science*

August 2017 - June 2021

*Beijing, China*

- Overall GPA: 3.77/4.00
- An elite class for computer science and interdisciplinary science includes information theory and physics supervised by Turing Award winner Professor Andrew Chi-Chih Yao
- Received A or A+ for all physics courses, including *Quantum Computer Science* and *Quantum Information*
- Major Scholarship:
  1. *Tsinghua Xuetao Scholarship* in Computer Science for 2017-2020 Academic Years (Top 1%)
  2. *Outstanding Freshman Scholarship* for 2017-2018 Academic Year (Top 3%)

### University of Sydney

*Oversea Summer Research Internship*

June 2019 - August 2019

*Sydney, Australia*

- Conduct researches with Professor Steven T. Flammia on quantum computation and noisy quantum devices

### University of Technology Sydney (UTS)

*Oversea Winter Research Camp*

January 2020

*Sydney, Australia*

- With a special invitation from Professor Zhengfeng Ji to participate in the university's winter camp related to quantum computation, including quantum complexity theory and quantum supremacy

## RESEARCH INTERESTS

---

Primarily interested in and willing to focus on theoretical problems based on practical concerns, including but not limited to:

- Quantum state and channel tomography
- Noisy intermediate-scale quantum (NISQ) techniques and applications
- Quantum algorithm and quantum complexity theory

## PAPERS & PREPRINTS

---

- R. Harper, **W. Yu**, S. T. Flammia<sup>†</sup>, *Fast Estimation of Sparse Quantum Noise*, [PRX Quantum](#), **2(1)**, 010322.
- S. Chen\*, **W. Yu\***, P. Zeng<sup>†</sup>, S. T. Flammia, *Robust Shadow Estimation*, [PRX Quantum](#), **2(1)**, 030348.
- **W. Yu**, J. Sun, Z. Han, X. Yuan<sup>†</sup>, [Practical and Efficient Hamiltonian Learning](#).
- Y. Zhang, **W. Yu**, P. Zeng, G. Liu, X. Ma<sup>†</sup>, [Scalable fast benchmarking for individual quantum gates with local twirling](#).

## ACADEMIC EXPERIENCES

---

## Fast Pauli Noise Tomography

June 2019 - July 2020

*Make Main Contribution in Theoretical Derivation*

*Sydney & Online*

- I worked in Professor Steven T. Flammia's group and focused on noise tomography
- I provided suggestions for the editing of the paper *Efficient Estimation of Pauli Channels* and improved the sample complexity of the constructing algorithm
- Based on the previous work, we have proposed a fascinating protocol to estimate a sparse Pauli channel with a polynomial sample complexity and showed precise experimental results on IBM's physical platform in the paper, *Fast Estimation of Sparse Quantum Noise*
- In this work, I handled all theorems and proofs to guarantee the advantages of our proposal

## Robust Shadow Estimation

March 2020 - November 2021

*Propose the Topic to Make Shadow Robust*

*Online*

- I initiated this project with Pei Zeng to construct a robust protocol for shadow estimation
- Our work is based on Huang et al.'s recent paper, *Predicting Many Properties of a Quantum System from Very Few Measurements*, and we generalized the method to make it resilient against not only gate noise within the quantum circuit but also measurement errors. Therefore, our proposal is more practical and *immediately usable*
- In the paper, *Robust Shadow Estimation*, we employed random circuits to make noise de-coherent. The complexity cost of this general version is similar in magnitude to that of the ideal version, which is theoretically optimal according to information theory
- We made an oral presentation at the TQC conference in 2021

## Practical Hamiltonian Learning

January 2021 - January 2022

*Work as the Team Leader*

*Beijing*

- I cooperate with Professor Xiao Yuan on estimating a sparse Hamiltonian operator
- We propose a scalable and efficient algorithm to learn a Hamiltonian without specific structure assumptions and the prior knowledge about the thermal states
- The protocol is also robust against circuit noise and SPAM errors, which guarantees the practicality

## Local Randomized Benchmarking

November 2020 - March 2022

*Propose the Main Technique to Circumvent Exponential Complexity*

*Beijing*

- We worked with Professor Xiongfeng Ma on a more practical variant of *Randomized Benchmarking (RB)*, which employs single-qubit gates to benchmark and estimate a specific multi-qubit gate rather than some gate sets, and the gate can be chosen both from and beyond Clifford group
- We use a variant of cycle benchmarking to evaluate the average fidelity by gathering the average fidelity information from sampled irreducible representations

## RESEARCH EXPERIENCE

---

### Teaching Assistant (TA) at Tsinghua University

August 2020 - January 2021

- I was an undergraduate teaching assistant for a third-year undergraduate core course called *Quantum Information and Computation* conducted by Professor Xiongfeng Ma

### Research Assistant (RA) at Peking University

August 2021 - January 2022

- I was a research assistant in Professor Xiao Yuan's group at Peking University

### Research Assistant (RA) at Shanghai Qi Zhi Institute

January 2022 - June 2022

- I was a research assistant in Professor Dong-Ling Deng's group at Shanghai Qi Zhi Institute

## ADDITIONAL AWARDS & HONORS

---

- *Special Gold Medal* for Chinese Physics Olympiad, 2016
- *Scholarship for Excellent Studying* for 2018-2019 Academic Year from *Institute for Interdisciplinary Information Sciences (IIIS)*
- Invited oral report about the paper *Robust Shadow Estimation* and the overview of *Randomized Benchmarking* in Yao Class Seminar 2020.