YUCHEN ZHU

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Education

Southeast University (SEU) **Nanjing, China**
Bachelor of Engineering, Major in Electronic Science and Technology Sep 2021 - Present
GPA: 3.88/4.0 | **Average Score**: 90.79/100

University of California, San Diego (UCSD) **San Diego, CA**
Visiting Student Sep 2024 - Dec 2024

Publications

[1] **Yuchen Zhu**, Jinglei Cheng, Boxi Li, Kecheng Liu, Yidong Zhou, Yufei Ding, and Zhiding Liang. "Leveraging Hardware Power through Optimal Pulse Profiling for Each Qubit Pair." *arXiv Preprint*, 2024
[2] Fang Xiang, Keyi Yin, **Yuchen Zhu**, Jixuan Ruan, Dean Tullsen, Zhiding Liang, Andrew Sornborger, Ang Li, Travis Humble, Yufei Ding, and Yunong Shi. "CaliScalpel: In-Situ and Fine-Grained Qubit Calibration Integrated with Surface Code Quantum Error Correction." *arXiv Preprint*, 2024
[3] **Yuchen Zhu**, Ruixuan Yang, Yuhang Gu, Fangtian Gu, Lingyi Kong, and He Li. "Towards Fault-tolerant Design of Quaternary Quantum Arithmetic." *International Test Conference in Asia (ITC-Asia)*, 2024
[4] Jinglei Cheng*, **Yuchen Zhu***[1], Yidong Zhou, Hang Ren, Zhixin Song, and Zhiding Liang. "EPOC: An Efficient Pulse Generation Framework with Advanced Synthesis for Quantum Circuits." *arXiv Preprint*, 2024
[5] **Yuchen Zhu***, Yidong Zhou*, Jinglei Cheng*, Yuwei Jin*, Boxi Li, Siyuan Niu, and Zhiding Liang. "Coqa: Blazing Fast Compiler Optimizations for QAOA" *International Conference on Computer-Aided Design (ICCAD)*, 2024
[6] Hua Hong, Junjie Zhang, **Yuchen Zhu**, Stephen D. Tse, Hongxuan Guo, Yilin Lai, Yubo Xi, Longbin He, Zhen Zhu, Kuibo Yin, and Litao Sun. "In Situ Polymer-Solution-Processed Graphene–PDMS Nanocomposites for Application in Intracranial Pressure Sensors." *Nanomaterials*, 2024.
[7] Yipu Du*, Jinyu Yang*, Kaidong Song, Qiang Jiang, **Yuchen Zhu**, David Go, and Yanliang Zhang "Autonomous Aerosol and Plasma Co-Jet Printing of Metallic Devices at Ambient Temperature" (submitted)

Patent

[1] Hua Hong, **Yuchen Zhu**, Jun Teng, et al. "A Wireless, Passive, and Implantable Intracranial Pressure Monitoring System" *CN 202410492497.7*, 2024.

Research Experience

In-situ Qubit Calibration Framework for Surface Code Quantum Error Correction **San Diego, U.S.**
Research Assisstant, Picasso Lab, UC, San Diego, Supervisor: Prof. Yufei Ding Sep 2024 - Present
Innovation: Developed a novel framework that enables in-situ calibration for surface code, offering the first practical solution for in-situ calibration in surface code based quantum computation

- Utilization of code deformation to separate qubits under calibration from logical qubit patches
- Generate optimized calibration schedules that minimize physical error rates based on device characterization
- Introduce modest qubit overhead and negligible increases in execution time

Efficient Pulse Generation Framework for Quantum Compilation **Notre Dame, U.S.**
Remote Intern, Liang Lab, Rensselaer Polytechnic Institute, Supervisor: Prof. Zhiding Liang Apr 2024 - Present
Innovation: Developed a novel pulse generation framework for quantum circuits, which introduced circuit synthesis into the workflow of quantum optimal control for the first time

- Designed a novel pulse generation framework for quantum circuits, which combined graph theory and quantum optimal control to generate high-fidelity pulses
- Introduced circuit synthesis into the workflow of quantum optimal control for the first time, which effectively solved the problem of pulse generation for large-scale unitary operations

[1] *** indicates equal contribution**

- Achieved 32% reduction in pulse latency comparing to the state-of-the-art pulse generation model, while maintaining the same fidelity

Design Space Exploration for Classical Algorithms on Quantum Circuits **Nanjing, China**
Research Assistant, Heterogeneous Intelligent and Quantum Computing Lab (HIQC), Supervisor: Prof. He Li Aug 2023 - Nov 2023

Innovation: Proposed a quantum circuit design to simulate efficient qudit adder with qubits, implementing a most-significant digit-first algorithm

- Proposed a quantum circuit design to implement qudit adder with most-significant digit-first algorithm based on existing quantum gates for qubits
- Explored low-depth architecture for qudit adder and performed comparison on gate number, circuit depth and implementation cost between qudit adders based on various algorithms
- Investigated the possibility of pulse-level design to avoid the use of ancillae, curtailed the duration of quantum circuits and thereby conserved the quantum resource

Demo Design for In-situ Low Temperature Plasma Sintering **Notre Dame, U.S.**
Research Assitant, ISURE, University of Notre Dame, Supervisor: Prof. Yanliang Zhang Jun 2024 - Sep 2024

Innovation:Designed a demo for in-situ low temperature plasma sintering method - a humidity sensor directly printed on ivy leaf

- Designed a humidity sensor which can be directly printed on ivy leaf using aerosol jet printing and in-situ low temperature plasma sintering
- Fabricated the humidity sensor and tested its performance in various humidity conditions
- Achieved competitive results compared to commercial leaf humidity sensor and demonstrated the potential of in-situ low temperature plasma sintering on biological substrates

Project

Passive, Wireless Monitoring System for Intracranial Pressure **Nanjing, China**
Project Leader Apr 2023 - Sep 2023

- Developed a passive wireless Intracranial Pressure (ICP) monitoring system which mitigated the second injuries, using Gr-PDMS nanocomposites as the sensing layer

Honors & Awards

- 2022 Dean's List (the highest honor sponsored by university, **Top 0.5%**)
- 2023 Dean's List (the highest honor sponsored by university, **Top 0.5%**)
- 2023 China FPGA Contest (National **1st Prize** & **Best Innovation Award**)
- 2023 Perfect Goodness Scholarship (**Top 1%**)
- 2022 Perfect Goodness Scholarship (**Top 1%**)
- 2022&2023 Merit Student (**Top 1%**) for two consecutive years
- 2022 Exemplary Individual of Academic Records (**Top 1%**)
- 2022 China Undergraduate Mathematics Competition (Provincial **2nd Prize**, National **2nd Prize**)
- 2022 China Top 10 Summer Social Practice Team
- 2023 China Undergraduate Electronic Design Contest (Provincial **2nd Prize**)

Skills & Interests

Programming Languages: Python (2 years), C/C++ (2 years), MATLAB (1.5 years), Verilog (1 year)
Tools & Frameworks: Git (1 year), LaTeX (2 years)
Platforms: Linux (Ubuntu), macOS, Windows
Languages: Mandarin (Native), English (Proficient)
Interests: Soccer, Swimming, Hiking