MENG WANG

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SUMMARY

I am a 5th-year Ph.D. candidate in Computer Engineering at the University of British Columbia, specializing in practical quantum computing for both the NISQ and fault-tolerant eras. My research involves developing advanced quantum circuit simulators and optimizing the execution efficiency of variational quantum algorithms. During my previous internship at Pacific Northwest National Laboratory, I gained valuable experience in high-performance computing for quantum simulations and collaborated with experts in Chemistry and Physics. Currently, during my second internship at PNNL, I am focusing on fault-tolerant quantum computing and quantum computing for chemistry simulation, further expanding my expertise in error correction and computational chemistry applications. This ongoing experience continues to enhance my interdisciplinary collaboration and deepens my understanding of high-performance computing in quantum simulations.

EDUCATION

Ph.D in Electrical and Computer Engineering *September 2020 - Present*
The University of British Columbia Vancouver, BC, Canada
Advisor: Dr. Prashant Nair

BASc in Computer Engineering *June 2020*
The University of British Columbia Vancouver, BC, Canada
Graduated with Distinction

CONFERENCE PUBLICATIONS

1. 📄 **MICRO '24** **Meng Wang**, Poulami Das, and Prashant Nair
   Qoncord: A Multi-Device Job Scheduling Framework for Variational Quantum Algorithms
   IEEE/ACM International Symposium on Microarchitecture, 2024

2. 📄 **ASPLOS '24** **Meng Wang**, Bo Fang, Ang Li, and Prashant Nair
   Red-QAOA: Efficient Variational Optimization through Circuit Reduction
   International Conference on Architectural Support for Programming Languages and Operating Systems, 2024

ARXIV PREPRINTS

1. 📄 **Meng Wang**, Rui Huang, Swamit Tannu, and Prashant Nair
   TQSim: A Case for Reuse-Focused Tree-Based Quantum Circuit Simulation
   arXiv preprint arXiv:2203.13892

2. 📄 Chenxu Liu, **Meng Wang**, Samuel A. Stein, Yufei Ding, and Ang Li
   Quantum Memory: A Missing Piece in Quantum Computing Units
   arXiv preprint arXiv:2309.14432

3. 📄 Fei Hua, **Meng Wang**, Gushu Li, Bo Peng, Chenxu Liu, Muqing Zheng, Samuel A. Stein, Yufei Ding, Eddy Z Zhang, Travis Humble, and Ang Li
   QASMTrans: A QASM-based Quantum Transpiler Framework for NISQ Devices
   arXiv preprint arXiv:2308.07581

4. 📄 Yue Shi, Chenxu Liu, Samuel Stein, **Meng Wang**, Muqing Zheng, and Ang Li
Design of an entanglement purification protocol selection module
arXiv preprint arXiv:2405.02555

5. 📄 Ang Li, Chenxu Liu, Samuel Stein, In-Saeng Suh, Muqing Zheng, **Meng Wang**, Yue Shi, Bo Fang, Martin Roetteler, and Travis Humble
TANQ-Sim: Tensorcore Accelerated Noisy Quantum System Simulation via QIR on Perlmutter HPC
arXiv preprint arXiv:2404.13184

WORKSHOP PUBLICATIONS

1. 🔗 **QCS '23** **Meng Wang**, Fei Hua, Chenxu Liu, Nicholas Bauman, Karol Kowalski, Daniel Claudino, Travis Humble, Prashant Nair, Ang Li
Enabling Scalable VQE Simulation on Leading HPC Systems
The International Conference for High Performance Computing, Networking, Storage, and Analysis Workshop: Quantum Computing Softwares, 2023

2. 🔗 **QCS '23** Fei Hua, **Meng Wang**, Gushu Li, Bo Peng, Chenxu Liu, Muqing Zheng, Samuel A. Stein, Yufei Ding, Eddy Z Zhang, Travis Humble, and Ang Li
QASMTrans: A QASM Quantum Transpiler Framework for NISQ Devices
The International Conference for High Performance Computing, Networking, Storage, and Analysis Workshop: Quantum Computing Softwares, 2023

3. 🔗 **QCCC '23** **Meng Wang**, Bo Fang, Ang Li, and Prashant Nair
Efficient QAOA Optimization using Directed Restarts and Graph Lookup
The Second International Workshop on Quantum Classical Cooperative Computing

WORK EXPERIENCE

Pacific Northwest National Laboratory *September 2024 - Present*
Ph.D. Research Intern. Mentor: Dr. Ang Li *Richland, WA, USA*

Pacific Northwest National Laboratory *October 2022 - August 2023*
Ph.D. Research Intern. Mentor: Dr. Ang Li, Dr. Bo Fang *Richland, WA, USA*

- Participated in developing simulation frameworks leveraging leading HPC systems including Frontier, Summit, and Perlmutter to simulate large-scale quantum circuits on GPU clusters. The simulation framework is open-sourced at https://github.com/pnnl/NWQ-Sim.

- Led research improving the efficiency of classical optimization in Quantum Approximated Optimization Algorithm (QAOA), yielding two publications: Red-QAOA (accepted at **ASPLOS'24**) proposing a circuit reduction technique, and INFORMR (in progress for **ISCA'25**) introducing an informed restart approach.

TEACHING EXPERIENCE

Teaching Assistant at UBC *Vancouver, BC, Canada*
CPEN 312 - Digital Systems and Microcomputers *January 2024 - April 2024*
CPSC 322 - Introduction to Artificial Intelligence *July 2022 - August 2022*
APSC 160 - Introduction to Computation in Engineering Design *January 2022 - April 2022*
CPEN 411 - Computer Architecture *September 2021 - December 2021*
CPSC 340 - Machine Learning and Data Mining *January 2021 - April 2021*

AWARDS

Faculty of Applied Science Graduate Award   *2021, 2022, 2023, UBC*
The annual award, subject to annual review and criteria fulfillment.

APSC Capstone Faculty Award   *May 2020, UBC*

Dean's Honour List   *Jun 2019, UBC*

Special Progressing Award   *Feb 2016, Langara College*

Entrance Scholarship   *Jul 2015, Langara College*

SKILLS

Programming skills:
Verilog, C, C++, CUDA, HIP, MPI, Java, Python, ARMv7 Assembly, Racket.
Software Packages:
Qiskit, Qulacs.
Hardware:
System-on-Chip (SoC) FPGA, Raspberry Pi, Arduino.