Su-un Lee

PhD Candidate at The University of Chicago
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Education

Ph.D. in Quantum Science and Engineering Sep 2022 – Present
University of Chicago, Chicago, IL
Advisor: Prof. Liang Jiang
Anticipated graduation: 06/27

B.S. in Physics & **B.S. in Mathematical Sciences** Mar 2016 – Aug 2022*
Seoul National University, Seoul, South Korea
Summa Cum Laude
* Military service [Mar. 2019 – Oct. 2020].

Work Experience

Returning Intern: Research Scientist (Scheduled) Jun 2026 – Sep 2026
IBM Thomas J. Watson Research Center, Yorktown Heights, NY
Mentor: Kunal Sharma.

Quantum Computing Theory Research Scientist Intern Jun 2025 – Sep 2025
IBM Thomas J. Watson Research Center, Yorktown Heights, NY
Mentors: Kunal Sharma, Abhinav Deshpande, and Kevin Smith.
Featured in Engineering the summer: Advancing quantum computing at IBM

Research Highlights

Opportunities and Limitations of Near-term Quantum Computers

- *Classical (in)tractability of quantum advantage experiments*: Identified the limitations of classical methods for several quantum advantage experiments, including advanced Pauli propagation and tensor network simulation.

- *Simulating dissipation with noisy ancilla*: Proposed a method to realize dissipative quantum dynamics with noisy ancilla qubits.

Information Processing and Complexity in Random Quantum Circuits

- *Classical simulation of random circuits*: Developed classical simulation methods for random circuits with generic noise, or noiseless shallow-depth random circuits.

- *Information processing in noisy random circuits*: Discovered a universal information spreading behavior that is intrinsic to noisy random circuits.

Benchmarking Near-term and Early Fault-tolerant Quantum Devices

- *Benchmarking logical quantum information processing*: Developed benchmarking methods for logical states and logical Pauli channels.

- *Benchmarking dynamical quantum circuits*: Developed methods for benchmarking quantum circuits with mid-circuit measurements and reset channels.

Undergraduate Research Program, Seoul National University   2020 – 2022

- Quantum information scrambling in continuous-variable systems: Advised by Prof. Hyunseok Jeong and Prof. Hyukjoon Kwon.

- Deep learning for dark-matter-only cosmological evolution: Advised by Prof. Ji-hoon Kim and Prof. Myungjoo Kang.

Technical Skills & Experience

Classical Simulation of Quantum Systems / Quantum Circuits

- Developed a pipeline for Projected Entangled Pair States (PEPS) and Belief-Propagation (BP) simulations (being actively used in multiple projects in IBM Quantum).

- Implemented MPS/MPO simulation from scratch using only NumPy functions (GitHub repository).

- Large-scale stabilizer simulation for pure and mixed states.

Machine Learning and Deep Learning

- Construct and train deep neural networks with PyTorch and TensorFlow, accelerated with Multi-GPU programming.

- Developed automatic hyperparameter optimization routines with Optuna.

High-Performance Computing (HPC)

- Cloud computing and multi-GPU programming supported by NVIDA Academic Grant Program.

- Midway, Research Computing Center, University of Chicago

- Nuiron & Neuron, Korea Institute of Science and Technology Information

Programming

- Programming languages: Python, Julia, etc.

- Version control: Git and GitHub

Awards & Honors

- **Kwanjeong Educational Foundation Scholarship**   2022 – 2027

- **Eminence Scholarship**, Seoul National University   2016, 2018, 2019

Publications

In reverse chronological order. See also Google Scholar

[1] **SL***, Ming Yuan*, Senrui Chen, Kento Tsubouchi, and Liang Jiang, Efficient benchmarking of logical magic states *Phys. Rev. Lett.* **136**, 050602 (2026).

[2] Han Zheng, Chia-Tung Chu, Senrui Chen, Argyris Giannisis Manes, **SL**, Sisi Zhou, and Liang Jiang, Efficient learning of logical noise from syndrome data. (2026), arXiv:2601.22286 [quant-ph].

[3] **SL**, Soumik Ghosh, Changhun Oh, Kyungjoo Noh, Bill Fefferman, and Liang Jiang, Classical simulation of noisy random circuits from exponential decay of correlation. (2025), arXiv:2510.06328 [quant-ph]. (Submitted to *Phys. Rev. Lett.*).

[4] Yifan F. Zhang*, **SL***, Liang Jiang, and Sarang Gopalakrishnan, Classically sampling noisy quantum circuits in quasi-polynomial time under approximate Markovianity (2025), arXiv:2510.06324 [quant-ph].

[5] **SL**, Changhun Oh, Yat Wong, Senrui Chen, and Liang Jiang, Universal spreading of conditional mutual information in noisy random circuits. *Phys. Rev. Lett.* **133**, 200402 (2024).

* Equal contribution

Presentations

Invited Talks

- Google Quantum AI Tensor Network Seminar, Google Quantum AI, CA   Jan, 2026

- IBM Quantum Computing PIC Seminar Series, IBM T. J. Watson Research Center, Yorktown Heights, NY   Oct, 2025

- IBM Quantum Computing PIC Seminar Series, IBM T. J. Watson Research Center, Yorktown Heights, NY   Sep, 2025

- Quantum Information Science and Engineering Seminar, University of Chicago, Chicago, IL Dec, 2024

Contributed Talks

- Global Physics Summit 2026, Denver, CO   March, 2026

- Korea Quantum Information Science Conference (K-QIS), Seoul, South Korea   Nov, 2025

- Global Physics Summit 2025, Anaheim, CA   March, 2025

- APS March Meeting 2024, Minneapolis, MN   March, 2024

Academic Service

Program Committee

- *2nd Workshop on HPC/AI Integration with Quantum Computing/Networking (HAIQ 2026)*

Journal Referee services

- *Physical Review A* (5 times)
- *PRX Quantum* (2 times)
- *Physical Review Applied* (1 time)
- *Quantum* (1 time)

Conference Reviewer

- *Theory of Quantum Computation, Communication and Cryptography (TQC 2026)*
- *29th Annual Conference on Quantum Information Processing (QIP 2026)*
- *25th Asian Quantum Information Science Conference (AQIS 2025)*
- *Theory of Quantum Computation, Communication and Cryptography (TQC 2025)*
- *28th Annual Conference on Quantum Information Processing (QIP 2025)*

Teaching Experience

University of Chicago

- Guest Lecturer – Advanced Quantum Information and Computation   Winter 2025
- Teaching Assistant – Advanced Quantum Information and Computation   Winter 2025
- Teaching Assistant – Intermediate Quantum Engineering   Autumn 2023

Seoul National University

- Teaching Assistant – Foundation of Physics 1   Spring 2022
- Teaching Assistant – Foundation of Physics 1   Spring 2021
- Teaching Assistant – Basic Calculus 1   Spring 2018

References

Liang Jiang
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University of Chicago
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Bill Fefferman
Associate Professor of Computer Science
University of Chicago
Email: wjf@uchicago.edu

Kunal Sharma
Senior Research Scientist / Team Manager
IBM T. J. Watson Research Center
Email: kunals@ibm.com