

Hyungseok Kim

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Research Interests

Quantum Compilers, Quantum Error Correction, Quantum Pulse Control, Quantum Algorithms.

Education

Yonsei University Seoul, Korea
M.S. in Electrical and Electronic Engineering Mar. 2025 – Feb. 2027 (Expected)

- Advisor: Prof. Won Woo Ro

Yonsei University Seoul, Korea
B.S. in Electrical and Electronic Engineering Mar. 2019 – Feb. 2025

- Capstone Project: *HS-Table: A Table-Based Algorithm for Optimizing Quantum Circuits through Qubit Reuse* (Advisor: Prof. Won Woo Ro)

B.A. in Economics (Double Major) Mar. 2019 – Feb. 2025

Research Experience

Yonsei University Seoul, Korea
• *Graduate Researcher*, Embedded Systems and Computer Architecture Lab (Advisor: Prof. Won Woo Ro) Mar. 2025 – Present

- *Undergraduate Researcher*, Embedded Systems and Computer Architecture Lab (Advisor: Prof. Won Woo Ro) Jun. 2024 – Feb. 2025

Publications ([Google Scholar](#))

Conference Papers

[C5] Changheon Lee, **Hyungseok Kim**, Seungwoo Choi, Youngmin Kim, and Won Woo Ro. “d’ArQ: A QOC Framework with Causality-Aware Grouping and Basis Selection.” *2026 IEEE International Symposium on High Performance Computer Architecture (HPCA)*, Sydney, NSW, Australia, 2026. DOI: [10.1109/HPCA68181.2026.11408534](https://doi.org/10.1109/HPCA68181.2026.11408534)

[C4] Enhyeok Jang, **Hyungseok Kim**, Yongju Lee, Jaewon Kwon, Yipeng Huang, and Won Woo Ro. “Toward Scalable Gate-Level Parallelism on Trapped-Ion Processors with Racetrack Electrodes.” *2026 IEEE International Symposium on High Performance Computer Architecture (HPCA)*, Sydney, NSW, Australia, 2026. DOI: [10.1109/HPCA68181.2026.11408608](https://doi.org/10.1109/HPCA68181.2026.11408608)

[C3] **Hyungseok Kim**, Enhyeok Jang, Seungwoo Choi, Youngmin Kim, and Won Woo Ro. “QRMap: A Map-Based Approach to Quantum Circuit Abstraction for Qubit Reuse Optimization.” *The 52nd Annual International Symposium on Computer Architecture (ISCA '25)*, Tokyo, Japan, 2025. DOI: [10.1145/3695053.3731020](https://doi.org/10.1145/3695053.3731020)

- *Merit Academic Paper Award* from Yonsei University Graduate School, 2026.

[C2] Enhyeok Jang, Youngmin Kim, **Hyungseok Kim**, Seungwoo Choi, Yipeng Huang, and Won Woo Ro. “Qubit Movement-Optimized Program Generation on Zoned Neutral Atom Processors.” *The 23rd ACM/IEEE International Symposium on Code Generation and Optimization (CGO '25)*, Las Vegas, NV, USA, 2025. DOI: [10.1145/3696443.3708937](https://doi.org/10.1145/3696443.3708937)

[C1] Enhyeok Jang, Dongho Ha, Seungwoo Choi, Youngmin Kim, Jaewon Kwon, Yongju Lee, Sungwoo Ahn, **Hyungseok Kim**, and Won Woo Ro. “Recompiling QAOA Circuits on Various Rotational

Directions.” *International Conference on Parallel Architectures and Compilation Techniques (PACT ’24)*, Long Beach, CA, USA, 2024. DOI: [10.1145/3656019.3676899](https://doi.org/10.1145/3656019.3676899)

Journal Papers

- [J1] Youngmin Kim, Enhyeok Jang, **Hyungseok Kim**, Seungwoo Choi, Changheon Lee, Donghwi Kim, Woomin Kyoung, Kyujin Shin, and Won Woo Ro. “Distribution-Adaptive Dynamic Shot Optimization for Variational Quantum Algorithms.” *Physical Review Research*, 7(4), 043253, 2026. DOI: [10.1103/vwhk-22b8](https://doi.org/10.1103/vwhk-22b8)

Workshop Papers (Non-archival)

- [W2] **Hyungseok Kim**, Enhyeok Jang, Youngmin Kim, and Won Woo Ro. “Native Gate-Aware QAOA Ansatz.” *The 1st International Workshop on Quantum Data and Machine Learning: Systems, Theory and Hardware (QDML ’25)*, In conjunction with ICDE ’25, Hong Kong SAR, China, 2025.
- [W1] Enhyeok Jang, Youngmin Kim, **Hyungseok Kim**, Dongho Ha, Yongju Lee, Jaewon Kwon, Jun Woo You, Jiho Park, and Won Woo Ro. “A Dead Gate Elimination for Quantum Programs.” *The 1st HPC/AI Integration with Quantum Computing Workshop (HAIQ ’25)*, In conjunction with HPCA ’25, Las Vegas, NV, USA, 2025.

R&D Projects

- University-Industry Foundation (UIF)**, Yonsei University Seoul, Korea
- Optimizing GPU-SSD Integrated System Architecture for Large-Scale Artificial Intelligence Learning, *Samsung Electronics DS Division* Oct. 2025 – Present
 - Research on Quantum Pulse Latency Reduction Through Quantum Optimal Control Framework, *National Research Foundation of Korea (NRF)* Jan. 2025 – Dec. 2025
 - Developing a High-Speed Quantum Circuit Simulator Supports Verification and Testing of Hyperscale Quantum Algorithms, *Hyundai NGV* Jul. 2024 – Oct. 2024

Professional Experience

Reviewer Support

- The 59th IEEE/ACM International Symposium on Microarchitecture (MICRO ’26) May 2026
- The 53rd International Symposium on Computer Architecture (ISCA ’26) Jan. 2026
- The 52nd International Symposium on Computer Architecture (ISCA ’25) Jan. 2025

Organizing Committee Assistant

- The 58th IEEE/ACM International Symposium on Microarchitecture (MICRO ’25) Oct. 2025

Scholarships and Awards

Fellowships and Scholarships

- BK (Brain Korea) 21 Research Fellowship, *Yonsei University* 2025 – 2026
- Graduate Student Research Assistant (GSRA), *Yonsei University* 2025

Honors and Awards

- Merit Academic Paper Award, *Yonsei University Graduate School* 2026
- Student-Designed Major Competition, *Yonsei University* 2nd Place (with \$360) 2024
- Academic Honors, *Yonsei University* 2024
- Micro-Learning Video Contest, *Yonsei University* 4th Place (with \$380) 2023
- Academic Honors, *Yonsei University* 2022

Teaching Experience

Teaching Assistant

- EEE 4473: Embedded System Lab. (Undergraduate) Spring 2025
- EEE 4610: Electrical and Electronic Engineering Capstone Design (Undergraduate) Spring 2025

Mentoring

- Mentorship Program for Undergraduate Research, *Quantum Information Science Club Association (QISCA)* Nov. 2025 – Jan. 2026
- Mentorship Program for High School Students, *Dong Incheon High School* Mar. 2019 – Jun. 2019

Talks

Invited Talks

- “QR-Map: A Map-Based Approach to Quantum Circuit Abstraction for Qubit Reuse Optimization”
- Journal Club, *Quantum Information Science Club Association (QISCA)* Sep. 2025

Selected Coursework

Yonsei University, Graduate, *Electrical and Electronic Engineering*

- *Quantum Computing*: Quantum Computer and Simulation 1, Quantum Computing, Quantum Data Science, Advanced Quantum Machine Learning
- *Computer Architecture*: Compiler Design and Optimization, Advanced Programming
- *Machine Learning*: Special Topics in Pattern Recognition
- *Digital System Design*: Semiconductor Memory Design

Yonsei University, Undergraduate, *Electrical and Electronic Engineering*

- *Quantum Computing*: Quantum Machine Learning
- *Computer Architecture*: Computer Architecture, Communication Networks, Operating Systems, Microprocessors, Multicore and GPU Programming
- *Machine Learning*: Introduction to Artificial Intelligence, Intelligent Control
- *Digital System Design*: Digital Microelectronics, System IC Design, Embedded System Lab.

Yonsei University, Undergraduate, *Economics*

- *Econometrics*: Econometrics I, Financial Econometrics
- *DSGE Modeling*: Dynamic Analysis of Macroeconomy, Quantitative Macroeconomics
- *Financial Engineering*: Introduction to Financial Engineering, AI Assisted Financial Engineering

Skill Set

Technical Qualifications

- Adobe Certified Professional (ACP) in Digital Video Using Adobe Premiere Pro, *Adobe Inc.* 2024
- General Computer User, Level-I (Highest), *Korea Chamber of Commerce and Industry* 2020

Programming Languages: C/C++ (OpenMP, CUDA), Python (Qiskit), JavaScript, MATLAB, Assembly Languages (RISC-V, ARM)

Other Languages and Tools: Verilog, LaTeX, Markdown, HTML, YAML, CSS, Jekyll, Git

Languages

Working Proficiency: Korean (Native), English (CEFR C1, TOEFL iBT 5.0/6.0)

In Progress: Spanish, Chinese, Japanese