JUNWOO JUNG

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RESEARCH INTERESTS

Neutral-atom quantum computing; analog quantum optimization (MIS/QUBO); quantum resource theories (thermodynamics/asymmetry); quantum simulation

PUBLICATIONS & PREPRINTS

- J. Park, **J. Jung**, and J. Ahn. *Deterministically Error-Mitigated Performance in Rydberg Quantum Computing for the Maximum Independent Set Problem*. **arXiv:2602.05432** [link]. 2026
- A. Byun, **J. Jung**, K. Kim, M. Kim, S. Jeong, H. Jeong, and J. Ahn. *Rydberg-atom graphs for quadratic unconstrained binary optimization problems*. **Advanced Quantum Technologies**, 2300398. [DOI]. 2024

TALKS & PRESENTATIONS

- **Scheduled Poster Presentation**, *2026 QISK conference. "Deterministically Error-Mitigated Performance in Rydberg Quantum Computing for the Maximum Independent Set Problem."* (arXiv:2602.05432) Feb 2026

RESEARCH EXPERIENCE

Research Intern **Sep 2025 – Present**
Quantum Computing Lab (Prof. Jaewook Ahn) *KAIST*

- Developed a **Deterministic Error Mitigation (DEM)** protocol using a physically informed binomial Hamming-shell model to evaluate Rydberg MIS experiments.
- Derived **entropy-controlled scaling** ($2^{NH_2(p)}$) of processing costs to establish a rigorous classical brute-force baseline for MIS instances.
- Quantified hardware-relevant efficiency using experimental data from the **Pasqal Fresnel** QPU, identifying a quantum–classical crossover point at $N \approx 13$.

Research Intern **Jan 2025 – Aug 2025**
Condensed Matter Theory Group (Prof. Gil Young Cho) *KAIST*

- Investigated behavior of the **chiral central charge** under deviations from the strict entanglement law, focusing on the structure of subleading corrections.

Visiting Research Intern **Aug 2024 – Jan 2025**
The inQlings (Prof. Nelly Ng) *NTU, Singapore*

- Investigated the gap between **Thermal Operations (TO)** and **Gibbs-Preserving Covariant (GPC)** channels within quantum resource theory.
- Produced an internal manuscript draft (not public) on catalysis-based approaches for relating TO and GPC under robustness assumptions.

Research Intern **Jun 2023 – Sep 2023**
Quantum Computing Lab (Prof. Jaewook Ahn) *KAIST*

- Investigated Rydberg-atom graphs for solving **Quadratic Unconstrained Binary Optimization (QUBO)** problems.

- Contributed to optimizing atom arrangements, supporting the publication in ***Advanced Quantum Technologies*** (2024).

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) **Mar 2023 – Present**
B.S. in Physics *Daejeon, Korea*

- **GPA:** 3.66 / 4.30
- **Relevant Coursework:** Scientific Computing for Quantum Information Science (Graduate), Quantum Information I/II, Quantum Mechanics I/II

Nanyang Technological University (NTU) **Aug 2024 – Jan 2025**
Exchange Program *Singapore*

- Completed coursework in Math and Physics while conducting research as a Visiting Intern at *The inQlings* lab.

HONORS & AWARDS

Second Place Presentation Award **Aug 2025**
2025 CAMPUS Asia Joint Research Presentation *KAIST, Korea*

- Awarded the **Second Place Prize** for the oral presentation entitled *"Exploring the Gap between Thermal Operation and Gibbs-Preserving Covariant Channel"*.
- Recognized for research clarity and technical depth among representatives from **KAIST, NTU, and Science Tokyo**.

SELECTED TRAINING & WORKSHOPS

Selected Participant **Dec 2025**
KIAS-SNU Physics Winter Camp 2025 *Seoul, Korea*

- Intensive program on *New States of Quantum Matter* and AI-driven Physics.

Summer Student **Summer 2025**
Technical University of Denmark (DTU) *Lyngby, Denmark*

- Completed an intensive **graduate-level coursework** on *Scientific Methods for Quantum Information Science* (5 ECTS).
- **Project:** Implemented **classical shadow tomography** to detect quantum phase transitions in the 1D Transverse-Field Ising Model. **[View Code]**
- Benchmarked shadow-estimated **Rényi-2 entropy** against exact diagonalization across the critical point ($g/J = 1$).

Participant **Jan 2024**
KAIST-MIT Quantum Winter School *Daejeon, Korea*

- Joint intensive program on quantum information science and experimental platforms.

TECHNICAL SKILLS

- **Programming:** Python (NumPy, SciPy, QuTiP, NetworkX), Mathematica, C++, MATLAB.
- **Quantum Platforms:** Analysis of **Pasqal Fresnel (rubidium atom array)** experimental data.
- **Languages:** Korean (Native), English (Fluent).