

Nuri Kang

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 [Nuri Kang](#) |  [Nuri Kang](#) |  [Nuri Kang \(0009-0008-4376-236X\)](#)

Center for Quantum Technology, Korea Institute of Science and Technology (KIST CQT), Seoul, Republic of Korea

RESEARCH INTEREST

Quantum Error Correction, Continuous Variable Systems, Open Quantum Systems, Quantum Foundations

EDUCATION

• M.S. in physics, Korea university

Cumulative GPA: **4.33/4.50** (37 credits)

Mar. 2023 - Feb. 2025

Seoul, Republic of Korea

- Advisor: [Prof. Dong-Hun Lee](#) and [Dr. Seung-Woo Lee](#)
- Thesis: [Linear optical quantum computing with multi-head cat qubits.](#)

• B.S. in applied physics, Kyunghee university

Cumulative GPA: **4.18/4.50** (144 credits) | Major GPA: **4.27/4.50** (116 credits)

Mar. 2016 - Feb. 2023

Suwon, Republic of Korea

PUBLICATIONS

P=IN PROGRESS, J=JOURNAL

[P.1] **Linear optical fault-tolerant quantum computation with bosonic multi-head cat qubit.**

[N Kang](#), J Lee, R Alexander, SW Lee.

Manuscript in progress, to be submitted to *PRX Quantum*.

[P.2] **All linear optical memoryless repeater with bosonic multi-head cat qubit.**

[N Kang](#), J Lee, D Lee, SW Lee.

Manuscript in progress, to be submitted to *npj Quantum Information*.

[P.3] **Operationally hidden or lost information in quantum measurement.**

J Shin, S Bagchi, [N Kang](#), HT Lim, SW Lee.

Manuscript in progress.

[J.1] **Fault-tolerant quantum computation by hybrid qubits with bosonic cat code and single photons.**

J Lee, [N Kang](#), SH Lee, H Jeong, L Jiang, SW Lee, *PRX Quantum* **5**, 030322 (2024).

News : [Phys.org](#), [The Quantum Insider](#), [Link of other news](#)

[J.2] **Encoded-fusion-based quantum computation for high thresholds with linear optics.**

W Song, [N Kang](#), YS Kim, SW Lee, *Phys. Rev. Lett.*, **133**, 050605 (2024).

News : [Phys.org](#), [Link of other news](#)

CONFERENCES

C=CONFERENCE

[C.1] **Fault-tolerance analysis of photonic hybrid quantum computation.**

[N Kang](#), J Lee, SW Lee, 23rd Asian Quantum Information Science (AQIS) Conference (2023).

Poster presentation.

[C.2] **Teleportation-based error correction with stabilizer code.**

[N Kang](#), SW Lee, Optical Society of Korea (OSK) Optics and Photonics Congress (2022).

Poster presentation, awarded **Best Poster Presentation**.

[C.3] **Teleportation-based error correction with stabilizer code.**

[N Kang](#), SW Lee, Optical Society of Korea (OSK) 5th Quantum Information Conference (2022).

Poster presentation, awarded **Best Poster Presentation**.

HONORS AND AWARDS

• Excellence award, Quantum Hackathon Korea - Team Leader

Jun. 2021

IonQ | Quantum Information Research Support Center | Ministry of science and ICT

Seoul, Republic of Korea

- Topic : Variational Quantum Algorithm (VQA) for portfolio optimization problem.
- Ranked TOP 3 out of 27 teams.
- Featured in the [Kyunghee University campus newspaper](#) (20. Sep. 2021) for this achievement.

RESEARCH EXPERIENCE

- **Quantum Information Theory Group, KIST CQT | Advisor : Dr. Seung-Woo Lee** Mar. 2022 - Present
LINK+ Field Training Program → (Undergraduate & Graduate) Research Assistant → Research Intern Seoul, Republic of Korea
 - **Defined hybrid qubits by integrating the four-head cat qubits with dual-rail single photon qubits and developed a high-success all-linear optical hybrid fusion operation [J.1].**
This work was conducted in collaboration with Prof. Liang Jiang at the University of Chicago.
 - * Performed fault-tolerance threshold calculations for measurement-based quantum computing (MBQC) architecture and analyzed resource overhead using Monte Carlo simulations with the PyMatching package.
 - * Designed unit resource generation schemes and conducted a detailed analysis of resource overhead.
 - **Developed and analyzed an encoded fusion-based quantum computing (FBQC) architecture using active (n,m)-Shor code encoded fusions [J.2].**
 - * Calculated error probabilities for encoded fusion under the photon loss errors to estimate thresholds.
 - * Optimized encoded fusion parameters to achieve the highest fault-tolerance thresholds and calculated the associated overhead and thresholds.
 - **Developed an all-linear optical Bell measurement for general multi-head cat qubits.**
 - * Analyzed fault-tolerance thresholds and resource overhead in the MBQC architecture, designing unit resource generation schemes with a focus on Raussendorf-Harrington-Goyal (RHG) lattice and bias-tailoring foliated XZZX lattice as outer codes ([P.1], [T.1]).
This work was conducted in collaboration with Xanadu's architecture team.
 - * Developed a memoryless one-way repeater scheme and analyzed the secret key rate and resource overhead [P.2].
- **Quantum Optics Group, KIST CQT | Advisor : Dr. Hyang-Tag Lim** Dec. 2020 - Feb. 2021, Jul. 2021 - Aug. 2021
LINK+ Field Training Program | UST internship Suwon, Republic of Korea
 - **Quantum State Tomography (QST) and Quantum Process Tomography (QPT).**
 - * Converted Maximum Likelihood Estimation (MLE)-based QST and QPT codes from Mathematica to Python, achieving an average runtime optimization of 40x.
 - * Implemented a linear regression-based method, achieving a speedup of 3-4 orders of magnitude over the MLE-based approach.

ACTIVITIES

- **Teaching Assistant - General Physics** Sep. 2023 - Dec. 2023, Mar. 2024 - Jun. 2024
Department of Physics, Korea university Seoul, Republic of Korea
 - Led practice sessions and designed as well as assessed assignments, midterm exams, and final exams.
- **Military service, Republic of Korea Army - Social Service Agent** Nov. 2017 - Oct. 2019
Security screening unit, Busan high court Busan, Republic of Korea
 - Served as a social service agent, responsible for security screening at the Busan High Court.

ADDITIONAL INFORMATION

- **Languages:** Korean (Native), English (Fluent)
- **Programming:** Python, Mathematica, LabVIEW